MAINTENANCE MANUAL

TTI 1200B, 1202B
PHASE JITTER TEST SETS
AND
1201A
HIT MONITOR

ADVANCED
COPY

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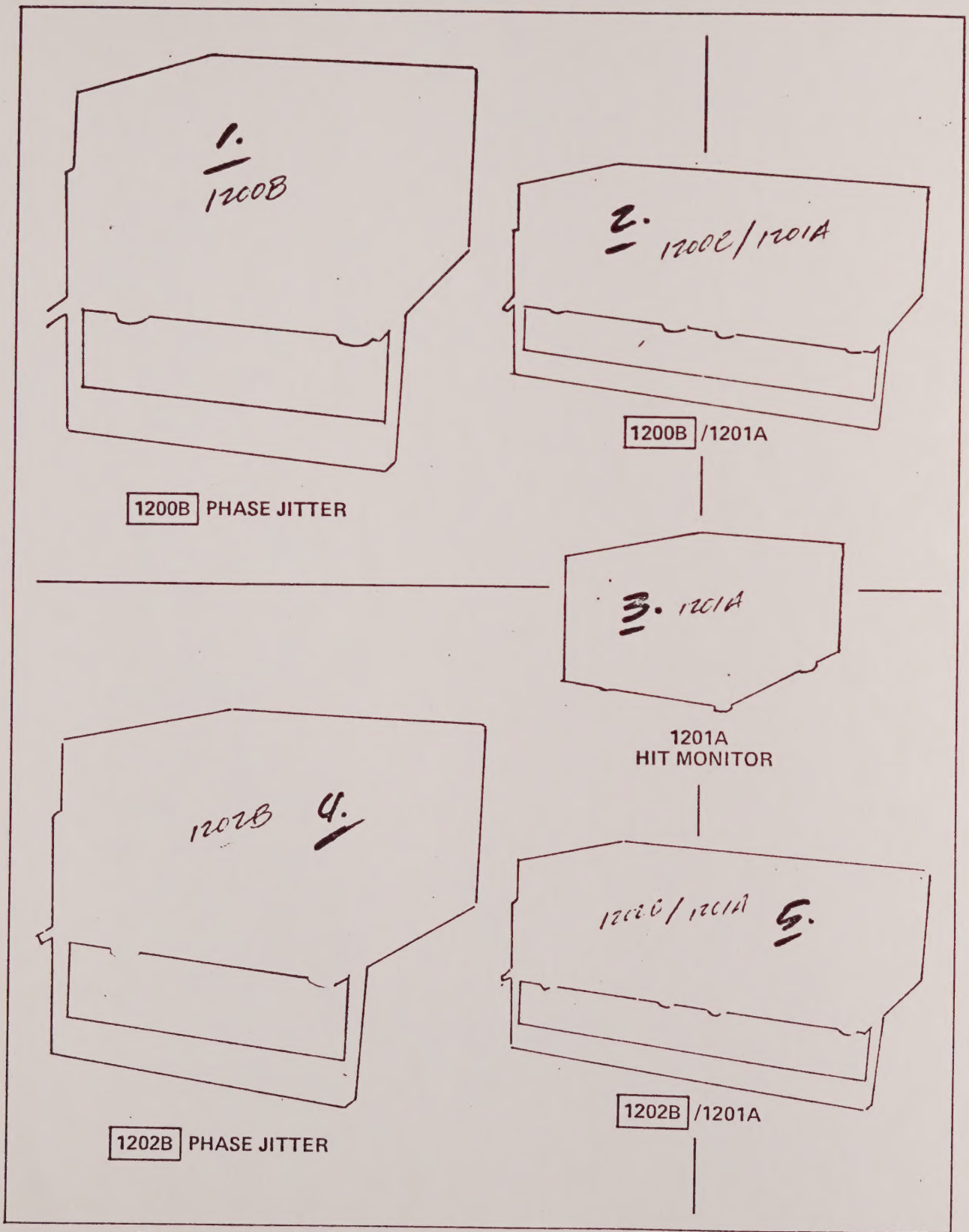

Figure 1-0. TTI 1200B, 1202B Phase Jitter Test Sets, and 1201A Hit Monitor

SECTION 1A

TTI 1200B & 1202B

PHASE JITTER TEST SETS

DESCRIPTION and OPERATION

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SECTION 1A

TTI 1200B & 1202B

PHASE JITTER TEST SETS

DESCRIPTION and OPERATION

1. GENERAL

1.01 This section includes two parts. Section 1A describes the 1200B and 1202B Phase Jitter Test Sets and procedures to be followed in using the instruments. Section 1B describes the 1201A Hit Monitor and operating procedures. All operating controls, indicators and connections on the 1200B and 1202B are also described in the respective sections.

1.02 Except for the carrier frequency feature, which is standard equipment in the 1202B, the 1200B and 1202B test sets are identical. For this reason, the discussions that follow refer to the 1200B and 1202B as the "Test Set". When reading this section in connection with the 1200B, simply disregard any references to the carrier feature, which is unique to the 1202B.

1.03 The TTI 1200B and 1202B Phase Jitter Test Sets measure phase jitter at voice-frequency (VF) points on transmission facilities. The 1202B also measures phase jitter at carrier frequencies. In addition, the Test Set incorporates a 1010 Hz oscillator. The Test Set receives a test tone from the far end and provides a digital display of the phase jitter present on the test tone. The measurement range is from 00.0 degrees to 99.9 degrees.

1.04 The Test Set automatically phase locks to the test tone frequency. Therefore no manual adjustments are necessary for setting signal level or for maintaining phase-lock.

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1.05 The Test Set incorporates three operating modes. These three modes, designated STANDARD, STD & LF (standard plus low frequency), and WIDEBAND, are explained in detail in Section 2.

1.06 The Test Set is a portable instrument which operates from 115 Vac or 230 Vac (switch selectable). The only required connection, besides power, is the input signal, which can access the test set in one of the following methods:

a. VF (voice frequency) jack--a standard tip-ring jack which accommodates a 310 plug.
b. rear terminals for VF connection
c. CXR (carrier input) jack--a standard 75-ohm coaxial jack.

1.07 Other features that are standard equipment in the Test Set includes:

a. DIAL/MEASURE capability which allows a dial set to be plugged in, a test circuit dialed, then a measurement made without dropping the line.
b. Push-button selection of 600-ohm, 900-ohm, or bridging input.
c. Oscillator output with a 1010 Hz $\pm$2 Hz signal at either 0 dBm or -29 dBm.
d. Damping, which determines whether the measurement is averaged over 0.1 or 1.0 second period.
e. Rear-panel detected-signal output terminals.

1.08 Either of the two test sets, the 1200B or the 1202B can be mated with the TTI 1201A Hit Monitor to form a single instrument. This combination allows phase hits, gain hits and drop outs to be counted and displayed. When the 1201A Hit Monitor is used, power and signal input

are received from the Phase Jitter Test Set. Details on the TTI 1201A Hit Monitor are covered in a separate manual.

2. OPERATING CONTROLS, INDICATORS AND CONNECTIONS

Front Panel

2.01 The following operating controls, indicators, and connections appear on the front panel of the Test Set. They are listed here from left to right and top to bottom.

a. POWER indicator. The LED indicator lights when the power switch is turned ON. The LED is OFF when power is turned OFF.

b. POWER switch. This push-button switch turns the instrument ON and OFF. The Test Set is turned OFF when the switch is IN. The Test Set is turned ON when the switch is OUT. When the optional front cover is locked in place over the front panel, the instrument is turned OFF, and cannot be accidentally left ON.

c. DIGITAL DISPLAY. Three Nixie tubes in the digital display provide a direct readout of phase jitter to a resolution of 0.1 degree. The display is automatically blanked when the incoming signal is outside the proper level range (-40 to +10 dBm) or when the instrument is not phase locked to the incoming signal frequency. The display is also blanked under certain conditions in the STD (standard) operating mode (see d,2 below). A decimal point on the left side of the display acts as an over-range indicator. This decimal is located inside the left Nixie tube and lights to indicate any measurement over 99.9 degrees.

d. MODE. This three-position switch selects one of the three operating modes. Operation in these modes is as follows:

1. STD + LF (standard plus low frequency). The STD + LF measurement mode responds to low frequency perturbations as well as standard phase jitter. In this mode the Test Set is responsive to jitter components from ±5 Hz to ±350 Hz (3-dB points) of the test tone frequency (1020 Hz ±40 Hz). The range of measurement in this mode is 0.00 to 99.9 degrees (single range).
2. STD (standard). The STD measurement mode responds to jitter components from ±14 Hz to ±350 Hz (3-dB points) of the test tone frequency (1020 ±40 Hz). The STD mode is identical to STD + LF, except for the extended low-frequency capability in STD + LF.
3. WIDEBAND. The WIDEBAND measurement mode responds to all components throughout the bandwidth of the applied signal, except for those components below 210 Hz and those within ±14 Hz of the test tone frequency (3-dB points). This mode is not responsive to test tone harmonics.

d. DIAL jack. The DIAL jack, in conjunction with the DIAL/MEASURE, switch allows a dial set to be connected to the Test Set and a test circuit to be dialed up. Once the connection is made, the Test Set holds the circuits during measurements. The DIAL jack accepts a standard 310-type plug.

e. DIAL/MEASURE switch. This is a two-position toggle switch. In the DIAL position, the switch parallels the VF INPUT jack and the DIAL jack to allow a test circuit to be dialed up. Once the test circuit is up, the switch can be placed to MEASURE and the circuit is held while a measurement is being made. During the measurement, the DIAL jack is disconnected from the VF INPUT jack, and the dial set may be removed. To avoid dropping the circuit,

do not disconnect the dial set until the switch is in MEASURE.

f. VF Input Z. This three-button group selects the proper Test Set input impedance for the VF input: 600 ohms, 900 ohms, or BRDG (bridging).

g. DAMPING. This push-button switch selects low or high damping. If the displayed reading varies rapidly, the DAMPING switch may be pushed to select high damping. The display is then updated at one-second intervals, rather than the normal intervals of 0.1 second.

h. INPUT. The INPUT group consists of a VF input jack for a 310-type plug, a MON (monitor) indicator, and a standard 75-ohm coaxial 358-type jack for CXR (carrier) input. The INPUT MON is an LED indicator which is illuminated only when the input signal level (VF or CXR) is below -40 dBm. If the INPUT MON goes OFF and the display remains blanked, a high noise input may be raising the input signal level above -40 dBm without providing a stable signal for the phase-lock loop to lock on. The display normally blanks as the MON indicator comes on.

i. CXR FREQ (kHz) (carrier frequency). This group of three push-buttons selects an internal crystal oscillator that allows the Test Set to accept a specific carrier frequency. The push-buttons are marked (in kHz) with the carrier frequency. Standard carrier frequency buttons are 108, 3100, and 3396 kHz. Other frequencies are available on special order.

IMPORTANT NOTE

Do not attempt to make VF and CXR measurements simultaneously. When any one of the CXR FREQ push-buttons is depressed, the VF jack is disabled. When all CXR FREQ push-buttons are out, the CXR jack is disabled.

j. 600Ω OUTPUT (oscillator). The 600Ω output group consists of a level-select toggle switch and a jack for a 310-type plug. The toggle switch presets the output level to 0 dBm or -29 dBm. The oscillator supplies a balanced output at 1010 Hz ±2.0 Hz.

Rear Panel

2.02

a. The Test Set rear panel is arranged in the following manner: SIGNAL INPUT (TB1). These terminals are connected in parallel with the INPUT jack on the front panel. They may be used instead of the jack to accept the incoming signal as follows:

TABLE 1
REAR TERMINAL PANELS

Terminal	Function
GRD	Sleeve
*IN	Tip
*IN	Ring

*Tip or ring can be connected to either IN terminal (not polarized).

b. OUTPUT (TB2). These terminals supply a detected phase jitter (analog) output. The output level is proportional to the phase jitter reading in that 10 degrees = 1 volt ±10%. These terminals are unbalanced and have a source impedance of 10K ohms.

c. 115/230. This slide-switch modifies the power supply configuration to accept either 115 Vac or 230 Vac input voltage.

3. OPERATION

Connecting the Test Set

3.01 Connect the Test Set as follows:

a. Set the front panel POWER switch to the IN (OFF) position.

b. Set the power slide-switch on the rear panel for the voltage to be used, 115 Vac (UP) or 23 Vac (down)

CAUTION

CHECK FOR THE PROPER FUSE. 115 Vac operation requires 1/2 amp slo-blo fuse. 230 Vac operation requires 1/4 amp slo-blo. These fuses are clipped to the rear of the Test Set.

c. Plug in the power cord.

d. Set the front panel POWER switch to the OUT (ON) position. At this point, the POWER and MON indicators should be ON.

e. Connect the circuit to be tested to the INPUT jack or to the SIGNAL INPUT terminals on the rear panel. The MON indicator will go OFF if the input signal is above -40 dBm, or remain ON if the signal is below -40 dBm.

f. Depress the VF INPUT Z button corresponding to the circuit source impedance 600 ohm, 900 ohm, BRDG.

g. Proceed with the appropriate measurements as described below.

IMPORTANT NOTE

If the test circuit is to be dialed up, perform the steps of paragraph 3.05 then proceed with the measurement.

VF Phase Jitter Tests

3.02 Once the Test Set is properly connected, the phase jitter measurement can be read directly from the digital display in degrees. Since

phase jitter test sets respond to a variety of transmission impairments other than true phase jitter, a comparison of three Test Set operating modes should be made. For example, if the STD reading is 10 degrees and the WIDEBAND reading is approximately 20 degrees, this two-to-one ratio indicates that the readings are caused by random noise, and virtually no phase jitter is present. Refer to Table 2 for a summary of the conclusions to be drawn from a comparison of the three modes.

TABLE 2

Isolation of Transmission Impairments
by Comparison of Operating Modes

MEASUREMENT			IMPAIRMENT
STD + L.F.	STANDARD	WIDEBAND	
X	X	2X	Wideband noise.
X	X	X	True Phase Jitter.
>X	X	X	Phase perturbation below 20 Hz.
X	X	>2X	Single Frequency Interference.

3.03 More detailed information on the three operating modes follows:

a. STD + LF. This mode requires a 1020 Hz ±40 Hz test tone and will measure components from ±5 Hz to ±350 Hz of the test tone frequency (3 dB points). Figure 1 shows both sides of a VF reference tone and gives the STD + LF points as they relate to standard response limits specified in Bell System Technical Reference PUB 41009.

b. STANDARD. This mode requires a 1020 Hz ±40 Hz test tone and will measure components from ±14 Hz to ±350 Hz of the test tone frequency (3 dB points). Figure 1 shows both sides of a VF reference tone and gives the STANDARD points as they relate to standard response limits specified in the Bell System Technical Reference PUB 41009.

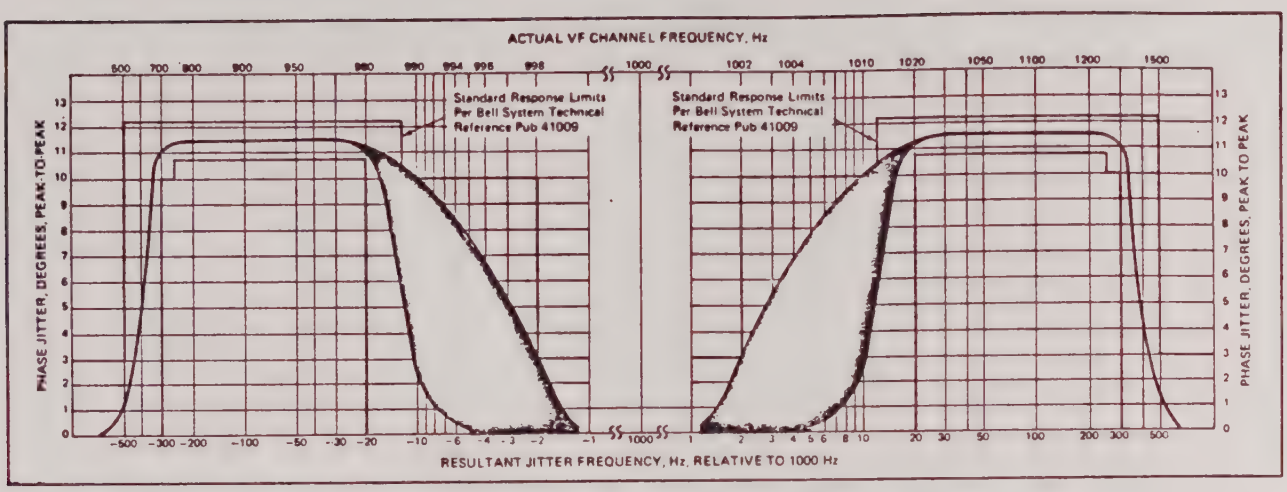

ACTUAL VF CHANNEL FREQUENCY, Hz
Standard Response Limits Per Bell System Technical Reference Pub 41009
Standard Response Limits Per Bell System Technical Reference Pub 41009
PHASE JITTER, DEGREES, PEAK-TO-PEAK
PHASE JITTER, DEGREES, PEAK TO PEAK
RESULTANT JITTER FREQUENCY, Hz, RELATIVE TO 1000 Hz

Figure 1. STD + LF measurement mode responds to low-frequency perturbations, as well as standard phase jitter. A higher STD + LF reading verifies the presence of low-frequency phase jitter. (The plots have been expanded on each side of the reference tone to show more clearly the low-frequency filter characteristics.)

c. WIDEBAND. This mode accepts any test tone frequency from 500 Hz to 3 kHz. It measures all components throughout this bandwidth except for those within ±14 Hz of test tone frequency or its harmonics (3 dB points). Figure 2 compares the response of the STD and the WIDEBAND operating modes.

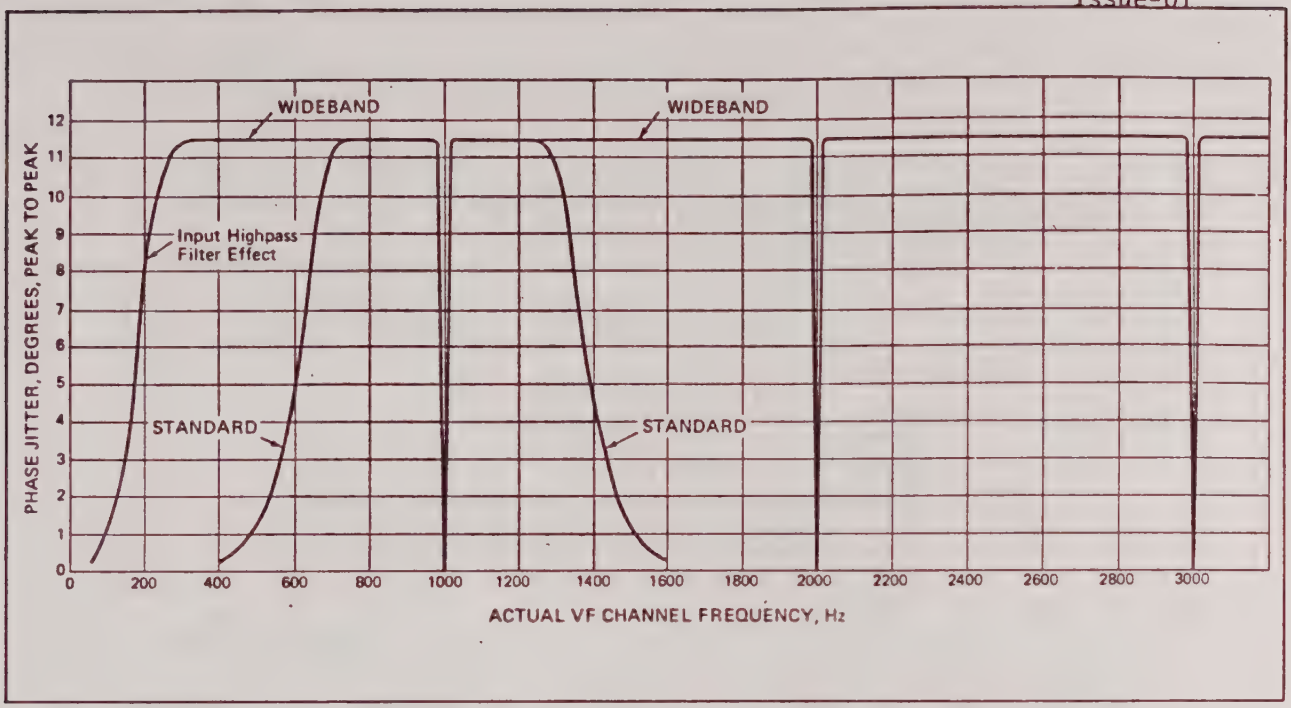


Figure 2. STANDARD measurement mode responds to approximately 700 Hz bandwidth centered about test tone, while WIDEBAND mode provides virtually flat response above 300 Hz with notches at harmonic frequencies. Comparison of readings in the two modes provides the basis for isolating true phase jitter from the effects of noise.

CXR Phase Jitter Tests

3.04 The 1202B Test Set has the capability for the direct measurement of phase jitter at carrier frequencies. When the proper CXR push-button is selected, the carrier frequency under test is internally heterodyned down to 1 kHz for the actual jitter measurement. Phase jitter measurements are made in the same manner as for VF tests. The only exception is the input signal level limits, which extend from -30 dBm to +10 dBm. If the input level drops below -30 dBm, the MON indicator will illuminate. This compares to -40 dBm for VF measurements.

Dialing Up a VF Test Circuit

3.05 To dial up a test circuit, proceed as follows:

a. Set the DIAL/MEASURE switch to DIAL.

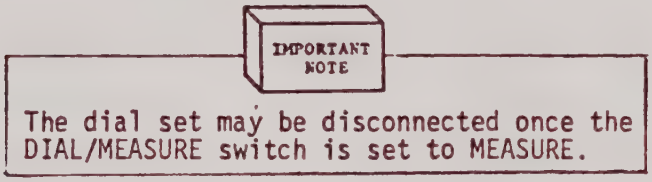
b. Select the proper VF termination: 600 ohms or 900 ohms.

c. Connect a dial set to the dial jack.

d. Dial up the circuit.

e. Place the DIAL/MEASURE switch to MEASURE before unplugging the dial set.

f. Read the measurement on digital display



4. SPECIFICATIONS

Measurement Modes

Standard.	Responsive to components within ±(14 Hz to 350 Hz) of test tone frequency (3 dB points).
STD + LF.	Responsive to components within ±(5 Hz to 350 Hz) of test tone frequency (3 dB points).
Wideband.	Responsive to all components throughout full bandwidth of applied signal, except for those components below 210 Hz and those within ±14 Hz of test tone frequency (3 dB points). Not responsive to test tone harmonics.

Display

Type.	Digital, 3 Nixie tubes, with over-range indicator. Direct readout of peak-to-peak phase jitter.
Range	00.0 to 99.9 degrees (single range)
Resolution.	0.1 degree (throughout full range)

Measurement Accuracy (for jitter frequency of 100 Hz)

0° to 30°	±1.0% of reading ±0.2 degree
30° to 60°.	±2% of reading ±0.2 degree

Measurement Variation vs. Jitter Frequency

(STANDARD and (STD + LF)

20 Hz to 300 Hz.	+3% of reading referenced to 100 Hz jitter frequency.

VF Test Requirements & Input Characteristics

Test Tone Frequency	
STANDARD and STD + LF Modes . .	1020 Hz ±40 Hz
WIDEBAND Mode	500 Hz to 3 kHz
Input Level.	-40 dBm to +10 dBm
Impedance	
Terminating	600 or 900 ohms, balanced
Bridging.	20 K ohms at 1 kHz, balanced
Longitudinal Balance, Input. . . .	50 dB @ ≤6 kHz
Input Protection	
Metallic: Bridging	300 Vdc
Terminating.	50 Vdc, 600 V for 10 µsec
Dial	90 V rms + 48 Vdc
Longitudinal.	300 V rms @ 60 Hz 600 V for 10 µsec to ground
Return Loss.	30 dB, or greater than 100 Hz to 3500 Hz
Terminal	Jack for 310 plug on front panel. Terminal strip on rear panel.

Carrier Frequency Test Requirements and Input Characteristics (1202B only)

Test Frequency	Group A (60 kHz to 320 kHz): 108 kHz standard other frequencies on special order Group B (1 MHz to 5.5 MHz): 3.100 MHz standard 3.396 MHz standard other frequencies on special order
Input Level.	-30 dBm to +10 dBm
Impedance.	75 ohms, unbalanced

Residual Phase Jitter	Less than 0.2° p-p
Terminal	Coaxial jack for 358 plug on front panel. No rear terminals.

Oscillator Output

Frequency	1010 Hz ±2.0 Hz
Level	0 dBm or -29 dBm Selectable by front panel switch.
Impedance	600 ohms, balanced
Residual Phase Jitter	Less than 0.1° p-p
Harmonic Distortion	All harmonics -60 dB or more relative to fundamental.
Terminal	Jack for 310 plug on front panel.

Analog Output

Level	Phase jitter, output, prior to peak-to-peak detector. Output level proportional to phase jitter reading. 10° = 1 volt ±10%.
Source Impedance	10,000 ohms, unbalanced
Terminal	Terminal strip on rear panel.

Power Requirement

Voltage	115/230 volts ac ±10%
Frequency	45 Hz to 400 Hz
Current	200 mA

Size

Height	5-1/4 inches
Width	7-3/4 inches (8-7/8 inches with handle)
Depth	11-1/4 inches
Weight	9-1/2 pounds
Operating Temperature Range	0° to 50°C

SECTION 1B

TTI 1201A HIT MONITOR

DESCRIPTION and OPERATION

1. GENERAL

1.01 The TTI 1200B and 1202B may be equipped with the optional Hit Monitor to count phase hits, gain hits, and dropouts. Adjustments include phase hit threshold (in degrees), gain hit threshold (in dB), and dropout duration (in milliseconds). The Hit Monitor uses an electronic timer that may be set to count for 5 minutes, 15 minutes, or continuously (up to 999 minutes). The Hit Monitor draws both its power and its input signal from the Phase Jitter Test Set. Thus, it requires no external connections.

2. OPERATING CONTROLS, INDICATORS, AND JACKS

Front Panel

2.01 The following controls, switches, and indicator appear on the front panel of the Hit Monitor.

a. START/RESET. This switch starts and resets the timer, which controls the interval over which the various events are counted.

b. DIGITAL DISPLAY. The three-digit display indicates the number of minutes the timer has been running, the number of phase hits counted, the number of gain hits counted, or the number of dropouts counted depending on the setting of the associated function switch.

c. FUNCTION SWITCH. This four-position switch (not labeled "function" on the panel) controls the function that appears on the digital

display. These are as follows:

1. TIME-MIN. When the switch is in this position, the display indicates the number of minutes the timer has been running (in other words, the number of minutes the counter has been counting phase hits, gain hits, and dropouts).
2. PHASE HIT. When the switch is in this position, the display indicates the number of phase hits that have been counted during the timing interval.

   GAIN HIT. When the switch is in this position, the display indicates the number of gain hits that have been counted during the timing interval.

   DROPOUT. When the switch is in this position, the display indicates the number of dropouts that have been counted during the timing interval.

> NOTE
> Since the various events are stored in seperate registers, the function switch may be changed at any time without destroying the count. The counter starts again only when the Start/Reset switch is pushed.

d. TIMER. This three-position switch controls the timing interval during which the counter counts phase hits, gain hits, and dropouts. The counter may be set to run for 5 minutes, 15 minutes, or continuously (up to 999 minutes). The counter stops automatically when it completes the timing interval for which it is set. The Start/Reset switch must be pushed before the timer will begin operating again.

e. PHASE HIT. This nine-position switch sets the phase hit counting threshold in 5-degree steps from 5 to 45 degrees.

f. GAIN HIT. This five-position switch sets the gain hit counting threshold for ±1, ±2, ±3, ±6, or +10 dB.

g. DROPOUT. This six-position switch sets the minimum duration of the dropouts that will be counted. It can be set for 1, 3, 10, 30, 100, or 300 milliseconds.

Rear Panel

2.02 Output terminals for phase hits, gain hits, and dropouts are provided on the rear panel of the Hit Monitor. They can be used to connect an external counter, a strip-chart recorder, or other display device. These connections provide a pulse which is slightly shorter than the particular event being counted. This slight delay in starting the output pulse is caused by the time necessary to detect the event and to distinguish it from another type of event. The delay times are as follows:

Phase hit:	1.4 millisecond
Gain hit:	3 milliseconds (approximately)
Dropout:	1 millisecond

2.03 DELAY SWITCH. The delay switch selects pulse width before a count can be made in either the Phase Hit or Gain Hit mode. For example; Setting the switch to 4 MSEC requires a Phase or Gain Hit of at least 4 MSEC in duration before the 1201A will count and display it.

2.04 The DELAY switch also sets the 1201A up for an external input for future impulse noise measurement. See NOTE in paragraph 3.01.

NOTE

The DELAY switch does not affect the DROP OUT mode.

3. OPERATION

Counting Phase Hits, Gain Hits, and Dropouts

3.01 Since the Hit Monitor receives both signal input and power from the Phase Jitter Test Set. no external connections to the Hit Monitor are necessary. To use the Hit Monitor, proceed as follows:

CAUTION

Ensure that the rear panel DELAY switch is NOT set to External if the 1200B or 1202B is supplying the input signal.

a. Set the Phase Jitter Test Set to either the STANDARD or the WIDEBAND mode.

NOTE

Changing either the Mode switch or the Impedance switch on the Phase Jitter Test Set while hit monitoring is in progress will introduce spurious hits, invalidating the count.

b. Set the Timer switch for the desired counting interval.

c. Set the Phase Hit, Gain Hit, and Dropout switches for the desired thresholds and duration.

d. Set the DELAY switch on the rear panel for the desired GAIN or PHASE Hit minimum duration.

NOTE

The DELAY switch does not affect the Drop Out mode

e. The position of the function switch does not affect the counting process. This switch may be used to read the elapsed time, the phase hit count, the gain hit count, or the dropout count at any time during or after the counting interval.

f. To erase the storage and start a new count, push the Start/ Reset switch.

> NOTE
> The EXT position of the DELAY switch, the EXT INPUT jack, and input terminal are for a future TTI development in Impulse Noise Counting. These should not be confused for an external input from which Phase Hits, Gain Hits, and Drop Outs are made.

4. SPECIFICATIONS

Input	Utilizes signal input from List 1 Phase Jitter Test Set (internally connected).
Phase Hit Counter	
Threshold, event magnitude	±5° to ±45° peak in 5° increments.
Threshold, event duration	0.1, 1.4, or 4.0 ms ±5% (Rear panel switch selectable).
Maximum counting rate	7 counts/second (143 ms delay between sequential counts).
Dropout Counter	
Threshold, event magnitude	-18 dB.
Threshold, event duration	1, 3, 10, 30, 100 and 300 ms.
Maximum counting rate	7 counts/second (143 ms delay between sequential counts).

Timer	
Counting period	5 min., 15 min., and continuous.
Counter capacity	999 counts.
Resolution	1 minute.
Display	3 digits (Nixie).
Analog Outputs	
Terminal	Terminal strip on rear panel.
Source impedance	130 ohms.
Output level	4-volt positive-going pulses into load impedance of 10,000 ohms or greater.
Phase and Gain Hit	Single pulse output for each event exceeding respective threshold setting and having a duration exceeding 0.1, 1.4, or 4.0 ms, dependent upon rear panel switch selection. Pulse duration equal to event duration less 1.4 ms or 4.0 ms.
Dropout	Single pulse output for each dropout exceeding the -18 dB threshold irrespective of event duration threshold setting. Pulse duration equal to event duration less 0.6 ms.
Power Requirement	Obtained from 1200B or 1202B Phase Jitter Test Set (internally connected).
Size	Height: 5-1/4 inches Width: 7-3/4 inches Depth: 11-1/4 inches
Weight	17 pounds (1200B or 1202B with 1201A)

SECTION 3

TTI 1200B, 1202B and 1201A

CALIBRATION PROCEDURES

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1200B and 1202B

PHASE JITTER TEST SET

CALIBRATION PROCEDURES

1. GENERAL

1.01 The carrier (CXR) feature, unique to the 1202B is the only difference between 1200B and 1202B calibration procedures. For this reason, steps 1.03 through 1.62 are intended for 1200B and/or 1202B calibration. Steps 1.53 through 1.67 are devoted to calibration of the carrier feature of the 1202B only. Calibration procedures for the 1201A are contained in steps through

PRE-CALIBRATION SET-UP

1.02 The steps in this procedure should be accomplished sequentially, in the order presented.

NOTE

The electrical and physical location of all test points and adjustable components can be found by referring to the proper fold-out in section 5 of this manual. Printed circuit board locations within the test set are shown on the 1200B/1202B flow diagram.

1.03 Connect the Test Set live card to a 115 Vac ±10%, 60 Hz source.

1.04 Rotate the front panel mode switch to STD.

1.05 Depress and latch IN the 600, (VF INPUT Z) pushbutton.

1.06 Ensure the DAMPING pushbutton is latched OUT (No damping).

1.07 Depress and latch the POWER pushbutton IN (turn power ON).

1200B/1202B POWER SUPPLY - CALIBRATION

1.08 +15 Vdc Calibration. Connect digital voltmeter input to test point V1 (+15 Vcd). Connect DVM ground input to the GRD terminal.

1.09 If necessary, adjust V1 ADJ (R17) for a +15Vdc ±0.1V reading.

NOTE

The +15 Vdc regulator supplies reference to the -15 Vdc and +5 Vdc regulator. Therefore, a defective +15 Vdc circuit can cause the -15 Vdc and +5 Vdc circuits to fail.

1.10 -15 Vdc Calibration. Connect digital voltmeter input to test point V2. Connect DVM ground input to the GRD terminal.

1.11 If necessary, adjust V2 ADJ (R18) for a -15 Vdc ±0.1V reading.

1.12 +5 Vdc Verification. Connect digital voltmeter input to test point V3. Connect DVM ground input to the GRD terminal.

1.13 Verify a +5 Vdc ±0.2V reading. No adjustment is possible to the +5 Vdc supply.

1.14 +170 Vdc Verification. Connect digutal voltmeter input to test point 170V. Connect DVM ground input to the RETURN terminal. (These testpoints are on the bottom of the power supply.)

1.15 Verify a +170 Vdc ±17V reading. No adjustment is possible to the +170 Vdc supply.

1200B/1202B OUTPUT AND DISPLAY CIRCUIT BOARD - CALIBRATION

1.16 +10 Vdc Reference Verification. On the Output and Display circuit board connect DVM input to IC11 pin 3. Connect DVM ground input to the ground terminal, E8.

1.17 Verify a -10 Vdc, ±0.3V reading no ajdustment is possible to the +10 Vdc reference voltage supply.

NOTE

+10 Vdc is actually generated on the INPUT Circuit board and is available at TP6 on that board.

1.18 -10 Vdc Reference Verification. On the Output and Display circuit board connect DVM input to TP2 (-10 Vdc). Connect DVM ground input to the ground terminal, E8.

1.19 Verify a -10 Vdc, ±0.5V reading. No adjustment is possible to -10Vdc.

NOTE

-10 Vdc reference is derived from +10 Vdc reference. If -10 Vdc is not present or out of spec, perform the +10 Vdc verification checks and determine whether +10 Vdc is missing or if the -10 Vdc inverter, IC 5B, is defective.

1.20 1010 Hz Oscillator Calibration. Connect 1010 Hz OUTPUT at the 1200B/1202B front panel to the INPUT of a TTI 1103 Transmission test set. (Use a 310 patch cord.) At the TTI 1103, select 600 ohm, TERMINATE and KHZ mode.

1.21 If necessary, adjust R42 (Frequency) on the Output and Display circuit board for a 1010 Hz, ±3 Hz reading.

1.22 Select dBm mode at the TTI 1103.

1.23 If necessary, adjust R50 (Level) on the Output and Display circuit board for a 0.0 dBm, ±0.5 dB reading.

1.24 VCO Zeroing. Connect test Oscillator to the 1200B/1202B as shown in Figure 3-2 . At the 1200B/1202B front panel, select: 600 ohms and STD mode. Depress and latch IN the BRDG pushbutton (terminate mode). On the Output and Display circuit board, jumper terminals E4 and E5 together.

1.25 Feed a 1-kHz ±0 Hz, -5 dBm ±1 dB, 600-ohm signal into the 1200B/1202B INPUT jack from the test oscillator.

1.26 If neccessary, adjust R35 for a front panel reading of 0.0 to 0.1 degrees. Remove the jumpers from terminals E4 to E5 on the Output and Display circuit board.

1.27 Phase Lock Loop 1 and 2 Set-up. Connect Test Oscillator as shown in Figure 3-2 .

1.28 Feed a 1 kHz ±0 Hz, -5 dBm ±1 dB, 600-ohm signal into the 1200/1202B INPUT jack from the test oscillator.

1.29 Phase Lock Loop 1 Calibration. On the Input circuit board, connect oscilloscope probe for Trace 1 (or A) to TP3. Connect oscilloscope probe for Trace 2 (or B) to TP4. Connect oscilloscope ground input to the 1200B/1202B power supply GRD terminal. Set the 1200B/1202B mode switch to STD.

1.30 Set oscilloscope as follows:

a. Display mode to ADD.

b. Delayed sweep time to .5 or 1 microsecond.

c. Horizontal Display mode to "B" delayed.

d. Volts/DIV to 2V/DIV.

1.31 Vary delay time multiplier until negative (trailing) edge is displayed.

1.32 If an error exists, adjust R42 (BALANCE) for trailing edge coincidence (negative-going edge). The maximum allowable lag between trailing edges is 1-microsecond.

1.33 Phase Lock Loop 2 Calibration. On the Input circuit board, connect oscilloscope probe for Trace 1 (or A) to TP8. Connect oscilloscope probe for Trace 2 (or B) to TP9. Connect oscilloscope ground input to the 1200B/1202B power supply GRD terminal. Set the 1200B/1202B mode switch to STD.

1.34 If an error exists, adjust R70 (Balance) for trailing edge coincidence (negative-going edge). The maximum allowable lag between the trailing edges is 1-microsecond.

1.35 Detector Zeroing. Ensure the mode switch is set to STD. If necessary, adjust R19 (Detector Balance) on the Output and Display circuit board for a 1200B/1202B front panel reading of 0.0 to 0.1 degrees.

1.36 Set mode switch to STD & LF. Verify a front panel reading of not more than 0.35 degrees.

1.37 Two-Tone Calibration. Connect two-tone test circuit as shown in Figure 3-3.

NOTE

The two tones generated by the two oscillators in the test set-up of Figure are used to simulate phase jitter. Accurate calibration of the Test Set requires a precise difference between the levels of the two oscillators. Therefore, the oscillators must be adjusted to exactly the levels specified.

1.38 To establish the proper two-tone set-up, perform the following steps:

a. Connect tone #1 oscillator 600-ohm output and tone #2 oscillator output to the 600-ohm matching pad.

b. Connect frequency counter to tone #1 oscillator 50-ohm output.

c. Connect TTI 1103 Transmission Test Set and the Phase Jitter Test Set under test to the 600-ohm matching pad output. (Connect in parallel.)

d. Set the TTI 1103 for a 600-ohm bridging measurement.

e. Set the Phase Jitter Test Set impedance switch to 600-ohm.

f. Set tone #2 oscillator output attenuator switch to -70dB (this effectively removes the oscillator from the test circuit without disconnecting leads).

NOTE

Once oscillator output levels have been established in steps (g) and (j), do not disturb the oscillator course and fine adjustments for the remainder of the two-tone calibration set-up.

g. Set tone #1 oscillator output to 1 kHz ±0 Hz as indicated on the frequency counter, and to -5.0 dBm ±0.1 kB as indicated on the TTI 1103.

h. Connect frequency counter to tone #2 oscillator 50-ohm output.

NOTE

Note the output attenuator switch position on the test oscillator prior to performing the next step.

i. Set tone #1 oscillator output attenuator switch to -70 dB (this effectively removes the oscillator from the test circuit without disconnecting leads).

j. Set tone #2 oscillator output to 1.1 kHz ±2 Hz as indicated on the frequency counter and to -25 dBm ±0.0 dB as indicated on the TTI 1103.

k. Return tone #1 oscillator output attenuator switch to the position previously set.

l. Proceed with calibration below.

1.39 Set mode switch to STD.

1.40 If necessary, adjust R49 (GAIN) on the INPUT circuit board for a front panel reading of 11.45 degrees ±0.5 degree.

1.41 Set mode switch to STD & LF.

1.42 Verify a front panel reading of 11.5 degrees ±0.2 degree.

1.43 Set mode switch to WIDE BAND.

1.44 Verify a front panel reading of 11.5 degrees ±0.2 degree.

1.45 Set tone 1 to 1 kHz, ±0 Hz at -5 dBm, ±0.1 dB by performing steps (b), (f), and (g) of paragraph 1.38.

1.46 Set tone 2 to 1.1 kHz, ±0 Hz at -18 dBm, ±0.1 dB by performing steps (h) thru (k) of paragraph 1.38 .

1.47 Verify a 25.9 degree, ±0.7 degree front panel reading by switch between the STD and STD & LF modes. Both modes must read 25.9 degrees, ±0.7 degree.

1.48 Frequency Response Verification. Connect the two-tone test circuit as shown in Figure 3-3 .

1.49 Set tone 1 to 1 kHz, ±1 Hz at -5 dBm, ±0.1 dB by performing steps (b), (f), and (g) of paragraph 1.38 .

1.50 Set tone 2 to 1010 Hz, ±0 Hz at -25 dBm, ±0.1 dB by performing steps (h) thru (k) of paragraph 1.38 .

1.51 Adjust tone 2 to the frequency given in the FREQUENCY column of Table 3-1. Verify the readings in the Tolerance column for the STD, STD & LF and WIDE BAND modes.

NOTE

Steps (h) thru (k) of paragraph 1.38 must be performed for each frequency given in Table 3-1.

Table 3-1. Frequency Response

Frequency (Tone 2)	STD (Tolerance)	STD & LF (Tolerance)	Wide Band (Tolerance)
1010 Hz ±1.0 Hz	5.0 degrees maximum	9.5 to 12 degrees	5.0 degrees maximum
1020 Hz ±1.0 Hz	10.6 +0 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1030 Hz ±5.0 Hz	10.6 to 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1100 Hz ±5.0 Hz	10.6 to 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1200 Hz ±5.0 Hz	10.6 to 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1270 Hz ±5.0 Hz	10.6 to 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1300 Hz ±1.0 Hz	10.6 to 12.3 degrees	10.6 to 12.3 degrees	10.6 to 12.3 degrees
1550 Hz ±5.0 Hz	2 degrees maximum	3 degrees maximum	10.6 to 12.3 degrees
1900 Hz ±5.0 Hz	No Test	No Test	10.6 to 12.3 degrees
2700 Hz ±5.0 Hz	3 degrees maximum	No Test	No Test
2900 Hz ±5.0 Hz	No Test	No Test	10.6 to 12.3 degrees

1.52 If the 1200B/1202B rear panel IN terminals are used for accessing the test set or if the terminals and associated internal wiring are suspected of being faulty, steps 1-20 thru 1.51 should be performed by connecting the input test signal to the IN terminals located on the 1200B/1202B rear panel.

Carrier Frequency Circuit Board - Calibration

1.53 Frequency Calibration. On the Carrier Frequency circuit board connect frequency counter input lead to TP2. Connect frequency counter ground input to the GRD terminal.

1.54 With the 1202B turned bottom side up, observe the location of the following components:

a. S1, Y1, C1

b. S2, Y2, C2

c. S3, Y3, C3

1.55 In addition, observe the frequency etched into each crystal (Y1, Y2, and Y3).

NOTE

Refer to the Carrier circuit board schematic and component locating diagram (Fold-out D) for component locations.

1.56 Depress and latch IN S1.

1.57 If necessary, adjust C1 to the frequency etched into crystal Y1, ±10 Hz.

1.58 Depress and latch IN S2.

1.59 If necessary, adjust C2 to the frequency etched into crystal Y2, ±10 Hz.

1.60 Depress and latch IN S3.

1.61 If necessary, adjust C3 to the frequency etched into crystal Y3, ±10 Hz.

1.62 Level Verification. Connect test oscillator to the 1202B carrier jack (75 ohms).

1.63 Connect frequency counter input lead to TP4. Connect frequency counter ground input to the GRD terminal.

1.64 Observe the frequencies etched into the three carrier pushbuttons.

1.65 Adjust the test oscillator output frequency to the value etched into pushbutton S1 (in kHz), at 0.0 dBm.

1.66 Verify a reading at the frequency counter of 1kHz, ±25 Hz at 0.0 dBm, ±2 dB.

1.67 Perform steps 1.64 thru 1.66 for S2 then S3.

1.68 This completes calibration of the 1200B/1202B Phase Jitter test sets. If calibration is required to the 1201A Hit Monitor, proceed with step 1.69. If no further calibration is necessary, remove all test equipment and reassemble the Test Set by referring to the reassembly procedures in paragraph 2.01 of this section.

Dropouts

1.69 Connect 1 kHz ±10Hz -5.0 ±1 dBm input signal to the 1200B or 1202B input.

1.70 Connect a DVM to TP2 on the 1201A circuit board P1200-018-01.

1.71 Multiply reading by 0.198.

1.72 Connect DVM to TP6 and adjust R46 so reading on DVM equals products of multiplication.

Negative Gain Hits

1.73 Connect DVM to TP 4 and multiply reading by 1.426.

1.74 Connect DVM to E4 and adjust R29 so reading in DVM equals product of multiplication.

Positive Gain Hits

1.75 Connect DVM TP3 and multiply reading by 1.76.

1.76 Connect DVM to E, and adjust R28 so reading on DVM equals product of multiplication.

Phase Jitter

1.77 Connect phase jitter input to the output of a signal generator with VCO capability (i.e. HP 3310 or Wavetek 136 [VCG]).

1.78 Set this generator to 1 kHz ±10Hz -5 dBm ±1.0dBrn.

1.79 Connect a sine wave generator to the VCO input of 1st generator.

1.80 Set 2nd generator frequency to 100Hz ±2Hz.

1.81 Set 2nd generator level such that the 1200, STD +LF reading is 60 degrees.

1.82 Set 1201A rear panel switch to 1.4 (sets without this are internally connected for 1.4 ms).

1.83 Set 1201A front panel switches to phase jitter and phase hit threshold to 30 degrees.

1.84 Adjust R34 so that 1201A just counts hits.

Verification of Operation and Calibration

1.85 Do not change test setup.

1.86 Connect scope to IC21 pin 8 and verify pulse of 1.4 ± .5 m sec.

1.87 Connect scope to IC17 pin 6 and verify pulse of 140 ± 20 m sec.

1.88 Disconnect scope.

Negative Gain Hit Verification

1.89 Using a generator with VCA capability (i.e. Wavetek 136) connect the 1200B or 1202B input to selected generator.

1.90 Set output of generator to -5dBm +1 and 1kHz + 10Hz.

1.91 Connect level measuring set (i.e. TTI 1103B) is parallel with 1200B or 1202B input.

1.92 Using a generator with a 85/15 duty cycle (i.e. HP 3310), connect the output of the pulse generator to the VCA input of the 1st generator.

1.93 Set frequency to 4 ±1Hz negative pulse.

1.94 Set 1201A front panel to gain hit, and gain hit threshold to ±6 dB.

1.95 Adjust 2nd generator pulse height to the point where 1201A just starts counting gain hits. (Rock the level on generator back and forth to obtain exact point 1201A starts counting.) The levels coming from the 1st generator should be b dB ±0.6 dB apart, (i.e. -5 and -11).

Positive Gain Hit Verification

1.96 Repeat the above procedure using a positive pulse from 2nd generator.

Dropout Time Verification

1.97 Set level out from generator #1 so that the difference between high and low level signal amplitude of second generator is greater than 20 dB .

1.98 Set "Drop Out Duration" on 1201A to 100 milliseconds, vary frequency of generator #] so that duration of drop-out is 95 milli sec and check that drop outs are not being counted.

1.99 Reduce frequency of generator 1, so dropout is 105 milli sec and check that drop outs are being counted.

DISASSEMBLY

To disassemble the Test Set, proceed as follows (See Figure 5-1):

a. Remove screws 1 from rear bezel mounting holes 2 .

b. Gently remove rear bezel 3 from the Test Set assembly 4 .

c. Slide top cover 5 , side covers 6a and 6b and bottom cover 7 to the rear and away from the Test Set assembly 4 .

d. For ease of handling during test, rear bezel 3 may be reinstalled with screws 1 .

e. This completes the disassembly required to gain access to all adjustments within the Test Set.

REASSEMBLY

To reassemble the Test Set, proceed as follows (See Figure 5-1):

a. Remove rear bezel 3 by removing screws 1 .

b. With green paint out, replace top cover 5 , side covers 6a and 6b (with louvers up), and bottom cover 7 (with rubber feet down).

c. Route power cable 8 through rear bezel 3 and fit bezel into place on the Test Set assembly 4 .

d. Replace screws 1 through rear bezel mounting holes 2 into pressed-nuts 2a . These screws must be moderately tight.

e. This completes the reassembly of the Test Set. It is now ready for operation.

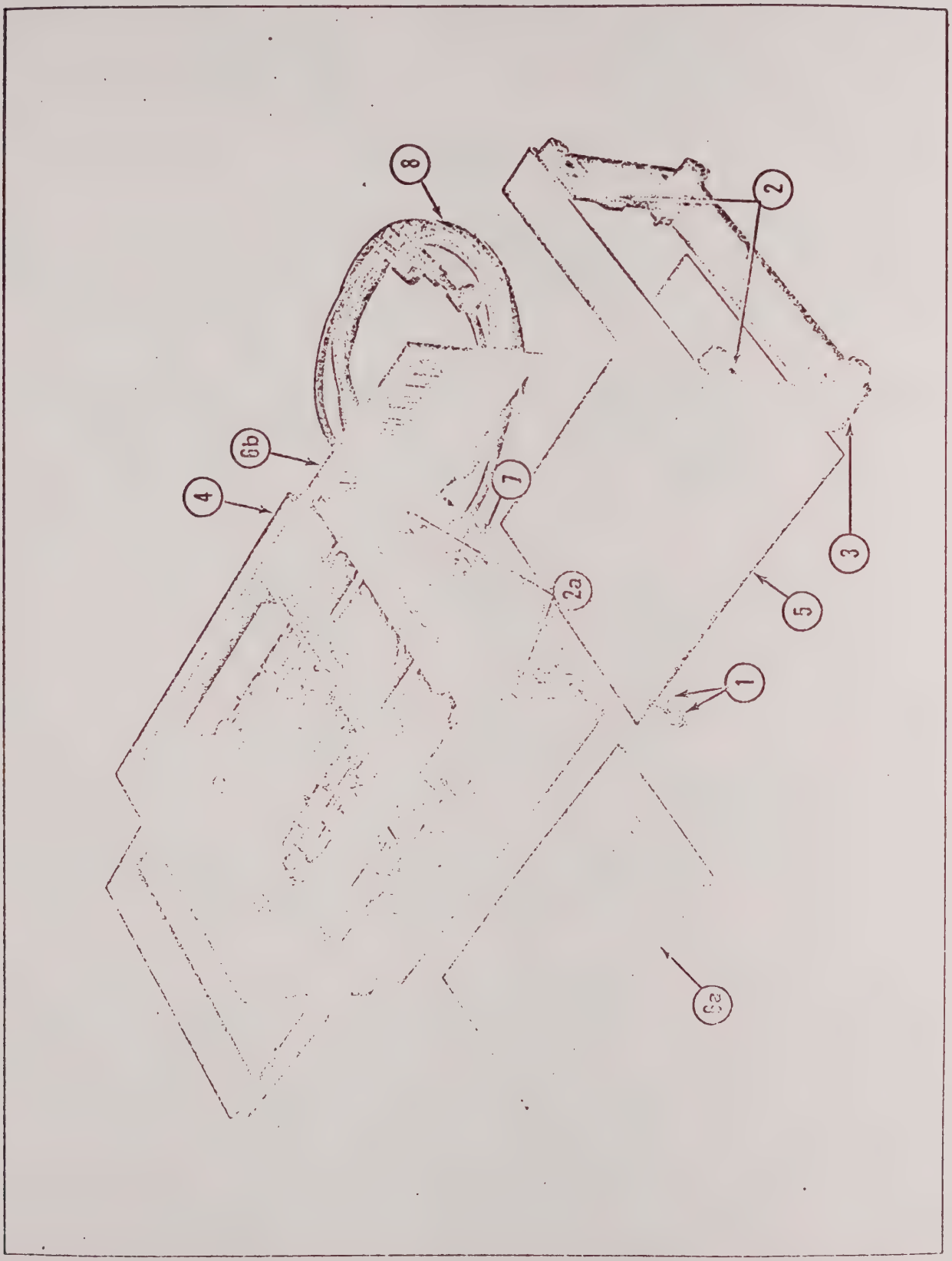

Figure 3-1 *TTI 1200 Phase Jitter Test Set, Disassembly/Reassembly.*

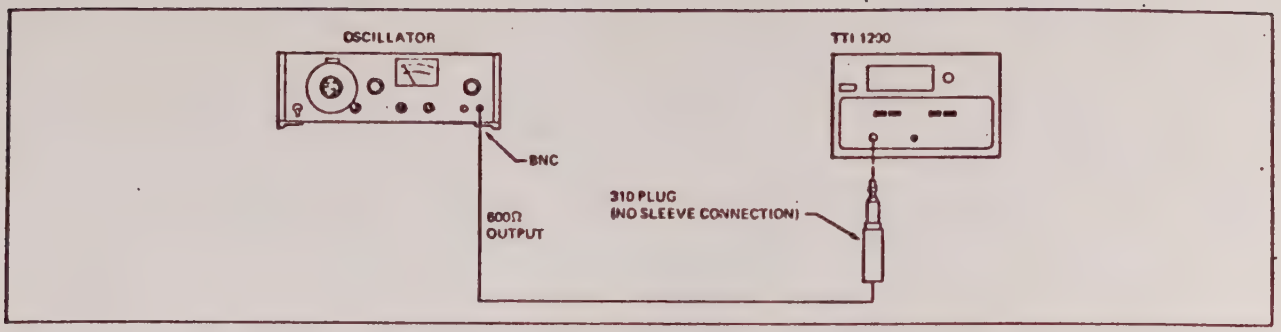

Figure 3-2 *Single-Tone Test Set-Up.*

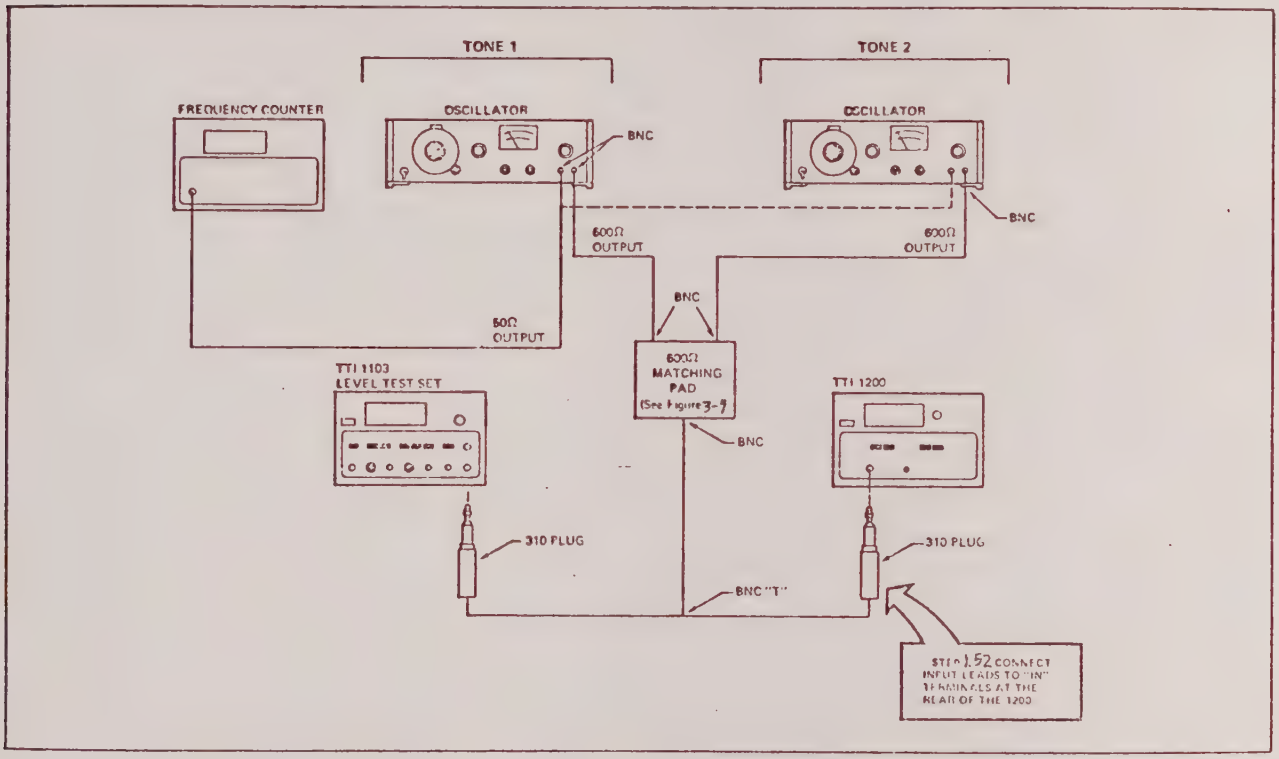

Figure 3-3 *Two-Tone Test Set-Up.*

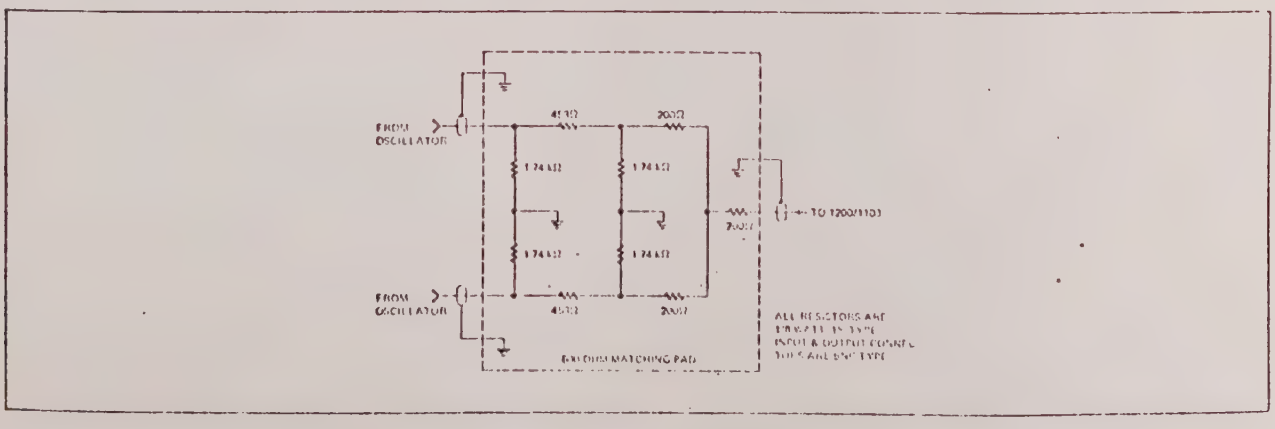

Figure 3-4 *600-Ohm Matching Pad.*

Section 4

TTI 1200B, 1212B, & 1201A

Aids in Troubleshooting

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1. GENERAL

1.01 Incorporated in the 1200B, 1202B, and 1201A, design are various unique circuit combinations. These combinations do, however, consist of a "basic few" building-blocks. This section describes these building blocks as an aid in recognizing and understanding the basic circuits. Such understanding, coupled with the "blocked" schematics in Section 5 of this manual will be helpful in troubleshooting and repairing the Test Set.

2. ACTIVE FILTERS

2.01 All filters used in the 1200B and 1202B are active, rather than the better known passive filters. Each stage of the filter consists essentially of an amplifier with frequency-sensitive feedback. Thus, the passive components include only resistors and capacitors. Figure 4-10 and Table 4-2 give the additional components associated with all operational amplifier circuits.

2.02 A filter of any complexity (for operation in the frequency region below 100-kHz) can be constructed by using a combination of four basic building blocks (filter sections). These filter sections are shown schematically in figures 4-1 through 4-4 as follows:

a. First -order lowpass filter, Figure 4-1.
b. Second-order lowpass filter, Figure 4-2.
c. First-order highpass filter, Figure 4-3.
d. Second-order highpass filter, Figure 4-4.
e. Bandpass filter, paragraph 4-10.

LOWPASS FILTER SECTIONS

2.03 The lowpass filter is a network which passes all frequencies below a specific frequency break point. Above this point, the signal is attenuated at a predetermined rate. The rate of attenuation is usually specified in terms of dB per octave.

2.04 The difference between the first-order lowpass in Figure 4-1 and the second-order lowpass in Figure 4-2 is the number of resistor/capacitor pairs. These components determine the rate at which the input signal is attenuated at frequencies above the filter break point, as described below:

a. The first-order lowpass filter consists of a single resistor/capacitor pair (R1/C1). At frequencies above the designed break point the input signal is attenuated by an additional 6 dB each time the input frequency doubles (definition of an octave).

b. The second-order lowpass filter in Figure 4-2 consists of two resistor/capacitor pairs (R1/C1, R2/C2). At frequencies above the break point the input signal is attenuated by 12 dB per octave. In this case, the input signal is attenuated by 6 dB at the break point due to component characteristics.

c. Each additional resistor/capacitor pair added to a filter circuit adds 6 dB per octave of attenuation. Other lowpass filters are:

1. Third-order lowpass (3R/C pairs).
2. Fourth-order lowpass (4 R/C pairs), and so on.

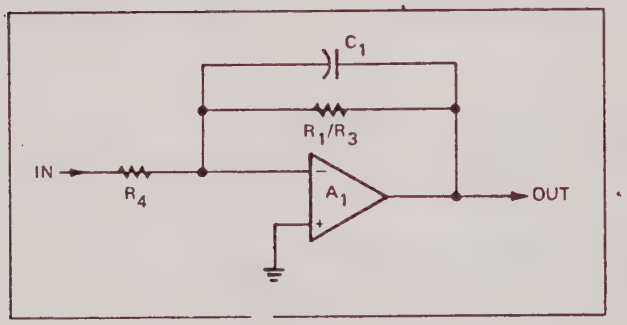


Figure 4-1. First-Order Lowpass Filter Section.

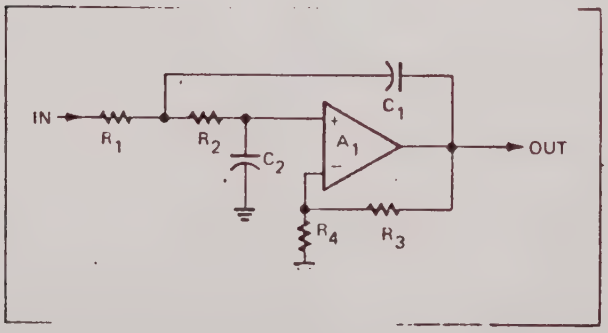


Figure 4-2. Second-Order Lowpass Filter-Section.

HIGHPASS FILTER SECTIONS

2.05 The highpass filter is a network which passes all frequencies above specific break point. Little or no losses occur to frequencies above the break point. However, below this point, the signal is attenuated. The rate of attenuation is usually specified in terms of dB per octave.

2.06 The difference between the first-order highpass in Figure 4-3 and the second-order highpass in Figure 4-4 is the number of resistor/capacitor pairs. These components determine the rate at which the input signal is attenuated at frequencies below the filter break point, as described below:

a. The first-order highpass filters in Figure 4-3 include a single resistor/capacitor pair (R1/C1). At frequencies below the break point the input signal is attenuated at 6 dB per octave.

b. The second-order highpass filter in Figure 4-4, consists of two resistor/capacitor pairs (R1/C1, R2/C2). At frequencies below the break point the input wignal is attenuated at 12 dB per octave.

c. Each additional R/C pair added to the highpass filter adds 6 dB per octave of attenuation. Other highpass filters are:

1. Third-Order highpass (3 R/C pairs).
2. Fourth-Order highpass (4 R/C pairs), and so on.

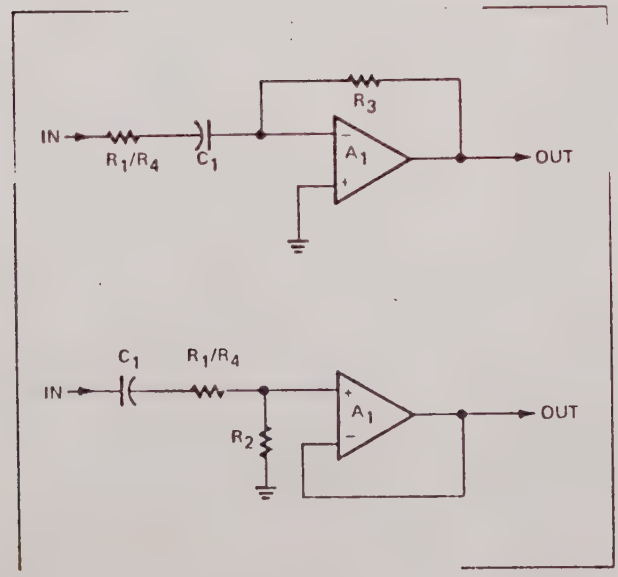


Figure 4-3. First-Order Highpass Filter Sections

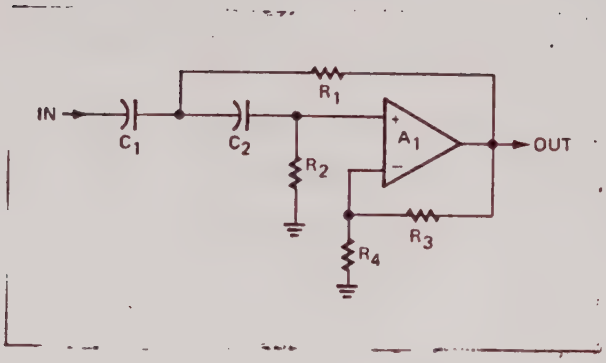


Figure 4-4. Second-Order Highpass Filter Section

The R/C components used in the four basic filter sections are identified with their function in Table 4-1.

Table 4-1. Filter Components

COMPONENT	FUNCTION
A_1	Gain
R_1,R_2,C_1,C_2	Frequency sensitive network. Establishes the frequency response of the filter.
R_3, R_4	DC Network. Establishes the dc gain of the filter. Feedback.

BANDPASS FILTER

2.07 The bandpass filter used in the 1103B simply consists of a highpass filter and a lowpass filter cinnected in series, thereby establishing two breaking points. Signals between these two points have little or no attenuation. However, signals below the lower break point and above the upper break point are heavily attenuated as discussed above.

3. OPERATIONAL AMPLIFIERS

3.01 Operational amplifiers (op amps) are used extensively in the 1200B, 1202B, and 1201A. With the exception of the application in active filter circuits discussed above, all applications of op amps fall into one of the

following categories:

a. Buffer (Unity gain).
b. Comparator.
c. Inverting.
d. Non-Inverting.
e. Integrator.

Table 4-2 shows all components that are associated with most op amp circuits, for bypass and compensation purposes.

BUFFER AMPLIFIERS

3.02 The buffer amplifier shown in Figure 4-5 simply isolates the output from the input. The amplitude and phase of the amplifier output is the same as that of the input. Other than the components mentioned in Table 4-2, the buffer appears as in Figure 4-5. (See Figure 4-10 for complete configuration.

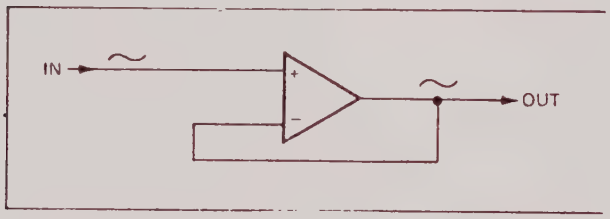


Figure 4-5. Op Amp Used as a Buffer Amplifier (Unity Gain).

COMPARATOR

3.03 Figure 4-6 shows an op amp used as a comparator. Comparison can be made between two varying inputs, two constant inputs or one constant and one varying input, depending on circuit requirements. In all cases, the comparator output switches from one voltage level to another when the inputs match or cease to match.

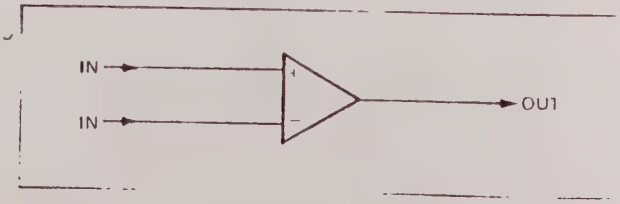


Figure 4-6. Op Amp Used as a Comparator.

INVERTING

3.04 In this application, the input is applied to the (-) terminal. Negative feedback is employed, and the output is 180° out-of-phase with the input. Figure 4-7 illustrates the inverting application. This configuration is characterized by:

a. Input impedance = R_1.
b. Input is applied to the inverting (-) terminal.
c. Negative feedback/gain is determined by the ratio: $\frac{R_2}{R_1}$.
d. Low output impedance, with 180° phase inversion.

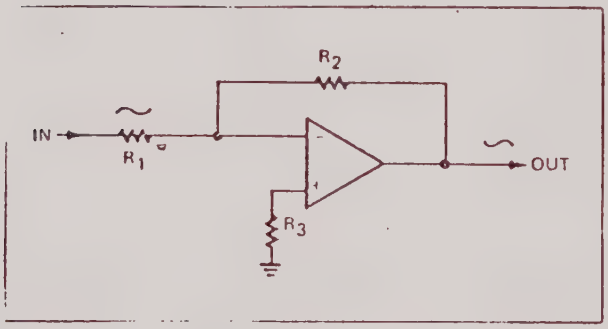


Figure 4-7. Op Amp Used in Inverting Application.

NON INVERTING

3.05 In this application, the input is applied to the (+) terminal. Negative feedback is employed and the output signal is in-phase with the input signal. Figure 4-8 illustrates the non-inverting application. This configuration is characterized by:

a. High input impedance at non-inverting terminal (+).
b. Gain = $1 + \frac{R_2}{R_1}$ (negative feedback).
c. Output is non-inverted, with low output impedance.
d. Voltage divider R_a/R_b is source to ground for op amp input.

INTEGRATOR

3.06 The integrator circuit shown in Figure 4-9 filters the input square wave and output is held at some proportional dc level above ground. The positive peaks on the input square wave cause slight triangular waveforms to appear on the dc output. The integrator output is usually filtered to remove the ripple, leaving a clean dc voltage.

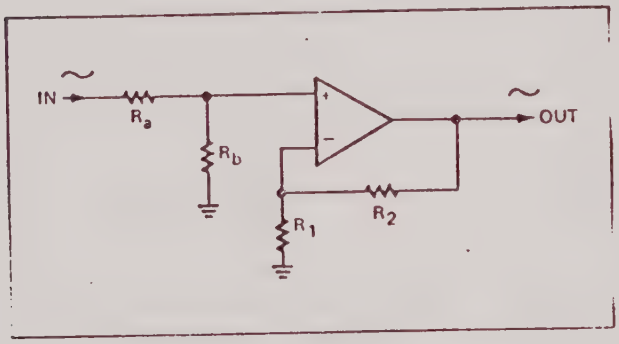


Figure 4-8. Op Amp Used in Non-Inverting Application

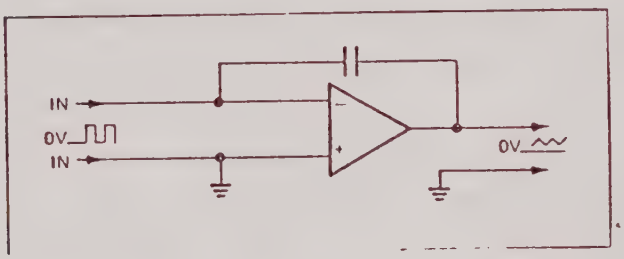


Figure 4-9. Op Amp Used As an Integrator.

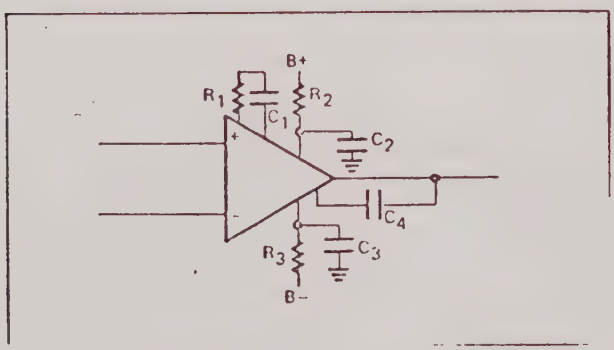


Figure 4-10. Op Amp Component Configuration. (See Table 4-2 next page.)

COMPONENT	FUNCTION
R_1	Compensation
C_1	Compensation
C_4	Compensation
R_2	Bypass
R_3	Bypass
C_2	Bypass
C_3	Bypass

Table 4-2. Op Amp Component Configuration.

4. LOGIC GATES

4.01 Various combinations of logic circuits are used in the 1200B, 1202B, and 1201A. However, they are all derived from the basic gates and descriptions that follow. In general, logic gates receive one of two inputs. These inputs are defined as logic levels and are:

a. H = HIGH (+5 Vdc) = Logic 1 (more Posititive).
b. L = LOW (GRD) = Logic 0 (More Negative).

Thus the 1103B circuitry operates on HIGH-TRUE logic.

4.02 AND. As shown in Figure 4-11, the AND-gate output (C) is HIGH (+5 Vdc) when all inputs (in this case A & B) are HIGH (+5 Vdc) simultaneoudly. When any one input or all inputs go LOW (GRD), the AND-gate output (C) is LOW (GRD). Therefore, a LOW (GRD) input controls the AND gate. See AND Truth Table, Table 4-3.

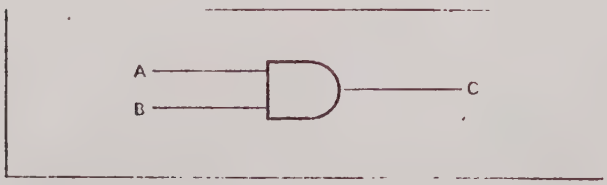


Figure 4-11. AND Logic Symbol

Table 4-3. AND Truth Table

INPUT		OUTPUT
A	B	C
L	L	L
L	H	L
H	L	L
H	H	H

4.03 OR. As shown in Figure 4-12, the OR-gate output (C) is HIGH (+5 Vdc) when any one input or all of the inputs (in this case A or B), are HIGH (+5 Vdc). When all inputs are LOW (GRD) the OR-gate output (C) is LOW (GRD). Therefore, a HIGH (+5Vdc) input controls the OR-gate. See OR Truth Table, Table 4-4.

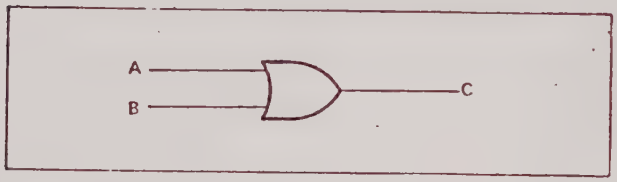


Figure 4-12. OR Logic Symbol

Table 4-4. OR Truth Table

INPUT		OUTPUT
A	B	C
L	L	L
L	H	H
H	L	H
H	H	H

4.04 NAND. As shown in Figure 4-13, the NAND-gate output (C) is HIGH (+5 Vdc) when any or all inputs (in this case A or B) are LOW (GRD). When all inputs are HIGH (+5 Vdc), the NAND-gate output (C) is LOW (GRD). Therefore, a LOW (GRD) input controls the NAND-gate. See NANd Truth Table, Table 4-5.

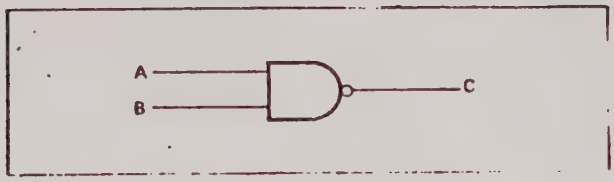


Figure 4-13. Nand Logic Symbol

Table 4-5. NAND Truth Table

INPUT		OUTPUT
A	B	C
L	L	H
L	H	H
H	L	H
H	H	L

4.05 NOR. As shown in Figure 4-14., the NOR-gate output (C) is HIGH (+5Vdc) when all inputs (in this case A & B) are LOW (GRD) simultaneously. When any one input or all inputs are HIGH (+5 Vdc), the NOR-gate output (C) is LOW (GRD). Therefore, a HIGH (+5 Vdc) input controls the NOR-gate. See NOR Truth Table, Table 4-6.

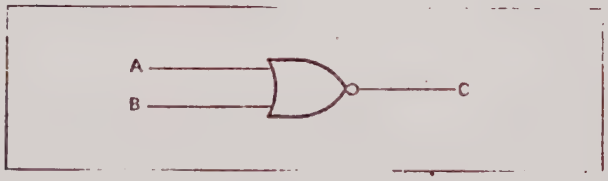


Figure 4-14. NOR Logic Symbol.

Table 4-6. NOR Truth Table

INPUT		OUTPUT
A	B	C
L	L	H
L	H	L
H	L	L
H	H	L

4.06 Inverter. As shown in Figure 4-15, the inverter output (B) is HIGH (+5 Vdc) when the input (A) is LOW (GRD). The Inverter Output (B) is LOW (GRD) when the input (A) is HIGH (+5 Vdc). The inverter has only one input. When NOR and NAND inputs are tied together, they also function as inverters. See Inverter Truth Table, Table 4-7.

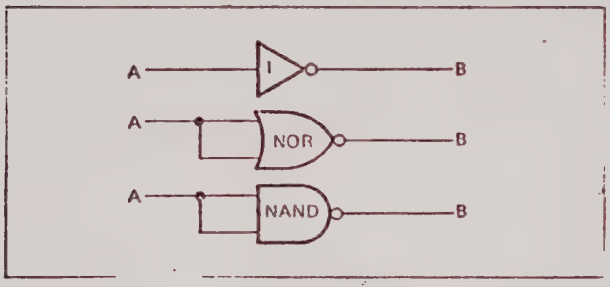


Figure 4-15. Inverter Logic Symbols

Table 4-7. Inverter Truth Table.

INPUT	OUTPUT
A	B
L	H
H	L

4.07 Exclusive-Or. As shown in Figure 4-16, the Exclusive Or-gate output (C) is HIGH (+5 Vdc) only when one input at a time is HIGH (+5 Vdc). The Exclusive Or-gate output (C) is LOW (GRD) when all inputs (in this case A & B) are HIGH (+5 Vdc) or when all inputs are LOW (GRD). Therefore, a single HIGH (+5 Vdc) input controls the Exclusive Or-gate. See Exclusive Or Truth Table, Table 4-8.

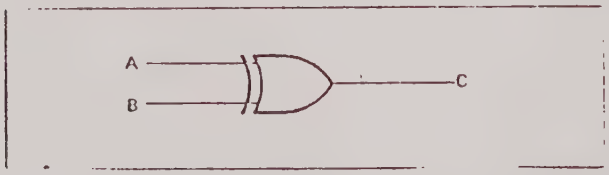


Figure 4-16. Exclusive-Or Logic Symbol.

INPUT		OUTPUT
A	B	C
L	L	L
L	H	H
H	L	H
H	H	L

Table 4-8. Exclusive-Or Truth Table.

4.08 "T" Flip/Flop. As shown in Figure 4-13, the "T" Flip/Flop outputs, Q and $\bar{Q}$, change state each time the trigger pulse at the T (toggle) input transitions from a HIGH (+5 Vdc) to a LOW (GRD). Therefore, a HIGH (+5 Vdc) transition on the toggle input controls the "T" Flip/Flop. A J-K Flip/Flop with J and K inputs tied HIGH (+5 Vdc) also functions like a "T" Flip/Flop. The "T" Flip/Flop may have direct set (SD) and direct reset (RD) inputs, in which case, a HIGH (+5 Vdc) to LOW (GRD) transition on the (SD) lead sets Q HIGH (+5 Vdc). A HIGH (+5 Vdc) to LOW (GRD) transition on the (RD) lead resets $\bar{Q}$ HIGH (+5 Vdc). See "T" Flip/Flop Truth Table, Table 4-9.

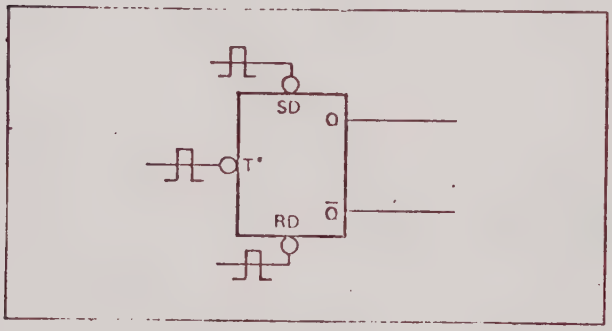


Figure 4-17. "T" Flip/Flop Logic Symbol.

Table 4-9. "T" Flip/Flop Truth Table

INPUT		OUTPUT	
CONDITION BEFORE TRIGGER AT T*		CONDITION AFTER TRIGGER AT T*	
Q	$\bar{Q}$	Q	$\bar{Q}$
L	H	H	L
H	L	L	H

*T = Clock (CL) + Clock Pulse (CP).

4.09 "J-K" Flip/Flop. As shown in Figure 4-18, the "J-K" Flip/Flop Q output goes HIGH (+5 Vdc) when the "J" input is HIGH (+5 Vdc) and T (toggle) input transitions from a HIGH (+5 Vdc) to a LOW (GRD). The Flip/Flop Q output goes HIGH (+5 Vdc) when the "K" input is HIGH (+5 Vdc) and the T (toggle) input transitions from a HIGH (+5 Vdc) to a LOW (GRD). Therefore, a HIGH (+5 Vdc) on one input lead and a HIGH (+5 Vdc) to LOW (GRD) transition on the T input controls the "J-K" Flip/Flop. The "J-K" Flip/Flop may have

direct set (SD) and direct reset (RD) inputs, in which case a HIGH (+5 Vdc) to LOW (GRD) transition on (SD) unconditionally sets Q HIGH (+5Vdc). A HIGH (+5 Vdc) to LOW (GRD) transition on (RD) unconditionally resets $\bar{Q}$ HIGH (+5 Vdc). See "j-K" Flip/Flop Truth Table, Table 4-10.

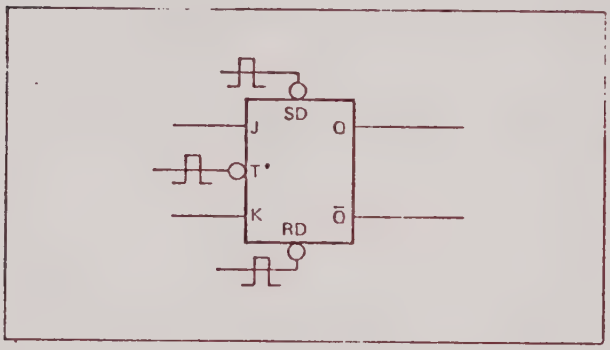


Figure 4-18. "J/K" Flip/Flop Logic Symbol.

Table 4-10. "R-S" Flip/Flop (Latch) Truth Table

INPUT			OUTPUT	
T•	J	K	Q	$\bar{Q}$
⎍	L	L	No Change	
⎍	L	H	L	H
⎍	H	L	H	L
⎍	H	H	See "T" Flip/Flop	

4.10 "R-S" Flip/Flop (Latch). As shown in Figure 4-19, a LOW (GRD) applied on the "S" input lead cuases the Q output to go HIGH (+5 Vdc). A LOW (GRD) applied on the "R" input lead causes the $\bar{Q}$ output to fo HIGH (+5 Vdc). Therefore, a LOW (GRD) input controls the "R-S" Flip/Flop. See "R-S" Flip/Flop Truth Table, Table 4-11.

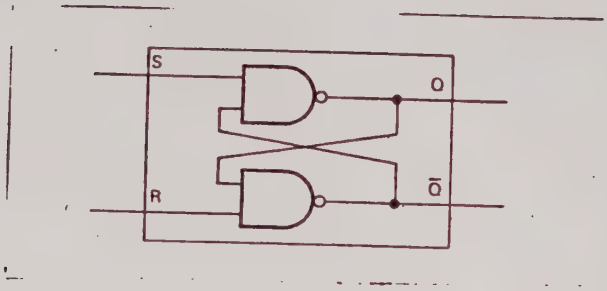


Figure 4-19. "R-S" Flip/Flop (Latch) Logic Symbol.

INPUT		OUTPUT	
R	S	Q	$\overline{Q}$
L	L	Not Allowed State	
L	H	L	H
H	L	H	L
H	H	No Change	

Table 4-11. "R-S" Flip/Flop (Latch) Table

NOTE

The Flip/Flops shown here are identified with J,K,T,R and S inputs, and Q, $\overline{Q}$ outputs. In actual practice, these can be any letters. However, they will always be arranged as shown.

4.11 Open Collector Gates. The logic gates shown in Figure 4-20 are of the open-collector type. The open-collector gate has no internal pull-up resistor on the output lead. Therefore, when any input (A or B) is LOW (GRD), the output transistor turns off and the output lead (C) floats. When all inputs (A or B) are HIGH, the output transistor in the gate is turned on and the gate generates a LOW (GRD) output. These gates are used in timing circuits, as drivers, and for wire (DOT)- And functions.

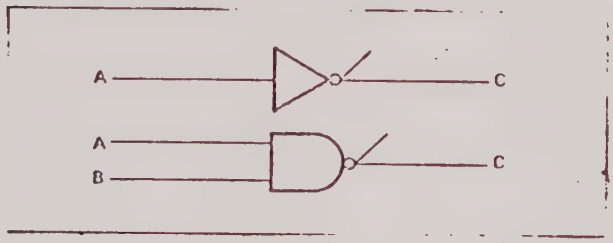


Figure 4-20. Open-Collector Logic Symbols

4.12 Wired-Or. The Wired-Or condition is not accepted as a logic gate within the 1103B because transistor-transistor logic (TTL) is used and the outputs of these types of gates cannot be shorted together. Rather, the Wired-Or symbol shown in Figure 4-21 simply indicates that a signal or voltage on any one of the inputs (A,B, or C) will appear at Point D. Obviously, if two different signals or voltages are simultaneously applied to the Wired-Or, they would be shorted together since the Wired-Or is simply a solder or tie point and offers no isolation between inputs or between the inputs and the outputs. An example of a Wired-Or condition is on the dc power supply schematic, Fold-out No. 6, bolck (B). Here, a voltage is applied to the output either through a transistor or a relay contact.

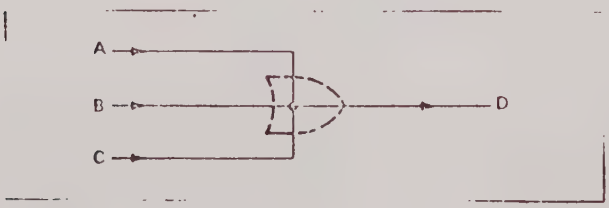


Figure 4-21. Wired-Or Function

4.13 Special Logic Gates. Shift registers (SR), Counters (CTR), and binary-to-decimal converters (BCD-DEC) are also used in the 1103B. These gates are much more complex than the basic logic gates. However, their funcions are readily understood from the input and the output lead terminology given in Table 4-12. The table also lists the corresponding abbreviations used on the schematics in Section 5 of this manual.

Table 4-12. Lead Abbreviations.

ABBREVIATION	FUNCTION
A	1-Bit (LSB)
A/R	Auto-Range
B	2-Bit
C	4-Bit
Clk	Clock-Toggle
CLR	Clear-Reset
D	8-Bit (MSB)
dBm	Level
Fx	Input Frequency X10
I	Input
K	Level (dBm) MSD 1-bit
L	Level (dBm) MSD 2-bit
LS	Left Shift
M	Level (dBm) MSD 4-bit
MC	Mode Control
MSB	Most Significant Bit
MSD	Most Significant Digit
O	Output
OOR	Out-of-Range
PDO	Pre-detected Output
PCB	Printed Circuit Board
R	Reset-Clear
RS	Right Shift
SI	Serial In
SO	Serial Out
V_1	Over-range
V_2	Under-range
V_L	Detected (Rectified) Signal
X_L	Damping Control

Table 5-2. 1202B Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			C-P1200-033-03	PANEL, FRONT	1	
	2			D-P1200-044-01	CHASSIS	1	
	3			D-P1200-015-03	ASSEMBLY, BOARD NO. 2	1	
	4			D-P1200-013-03	ASSEMBLY, BOARD NO. 1	1	
	5			B-P1200-039-01	WINDOW	1	
	6			972000001	JACK	3	
	7			940300003	DIODE, LIGHT EMITTING	2	
	8			970800002	KNOB	1	
	9			971600039	SWITCH	1	
	10			B-P1200-010-01	ASSEMBLY, CABLE	1	
	11			B-P1105-028-01	BRACKET, ANGLE	4	
	12			AD43BS	POP RIVET	4	
	13			NO. 6-32 X 5/16	SCREW, BIND. HEAD, SST	8	
	14			NO. 6	WASHER, STAR LOCK	8	
	15			971600013	SWITCH, TOGGLE	1	
	16			971600012	SWITCH, TOGGLE	1	
	17			NO. 4-40 X 5/16	SCREW, BIND, HEAD, SST	4	
	18			NO. 4	WASHER, INT. TOOTH LOCK	4	
	19			D-P1200-030-02	ASSEMBLY, BOARD NO. 4	1	
	20			970400026	CONNECTOR	1	
	21			NO. 4-40	NUT, KEP	1	

Table 5-2. 1202B Assembly Parts List (Continued)

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1103B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	22			NO. 4-40 X 1/2	SCREW, FLAT HEAD, SST	1	
	23			B-P1200-038-01	SPACER	2	
	24			B-P1100-029-09	ASSEMBLY, CABLE	1	

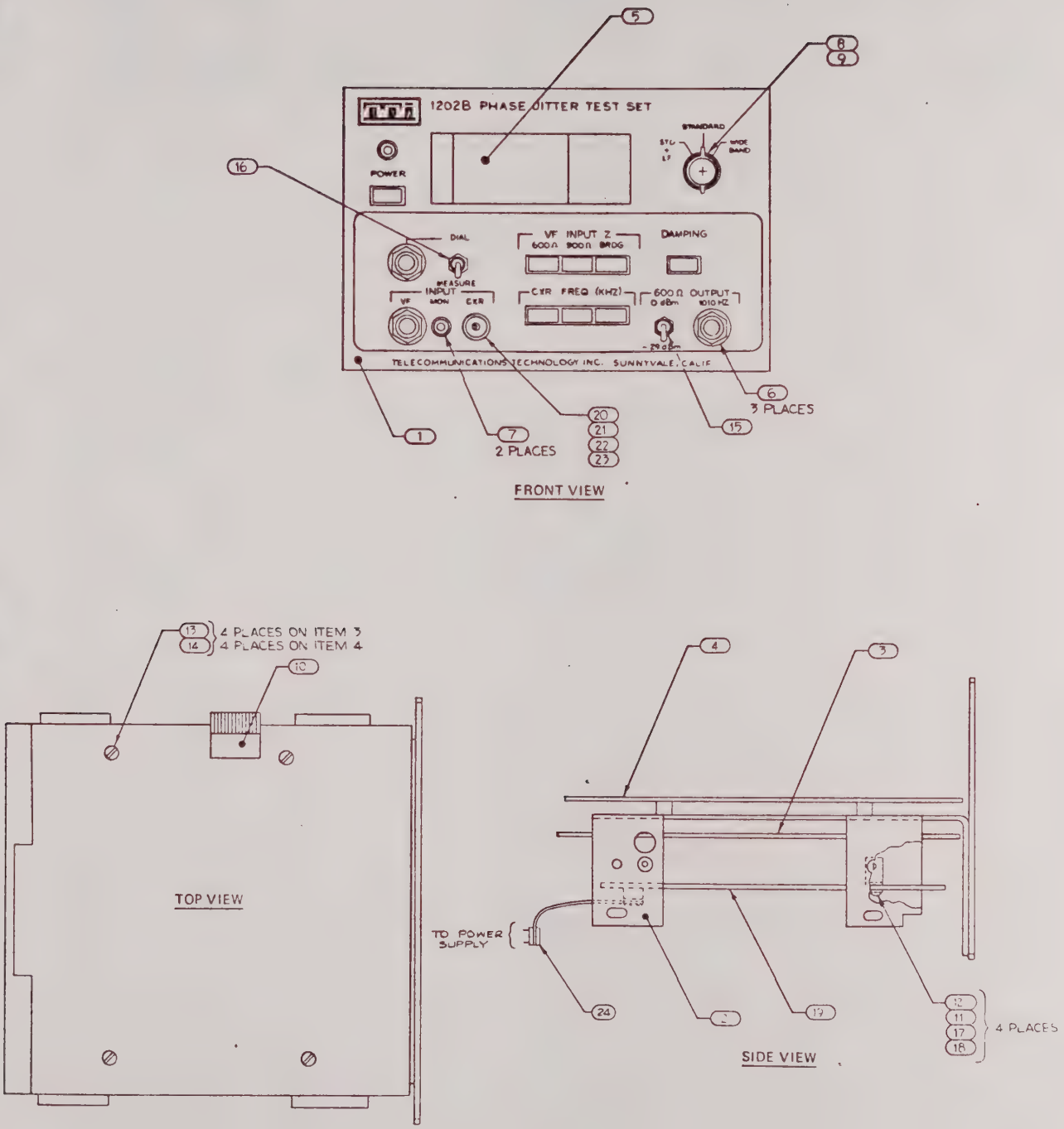


Figure 5-2. 1202B Assembly Drawing.

Table 5-3. 1200B/1202B Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			D-P1100-009-01	ASSY, FRAME AND HANDLE	1	
	3			D-P1100-043-01	CASTING, REAR	1	
	4			C-P1100-024-07	I.D. TAG, REAR PANEL	1	
	5			D-P1200-043-01	ASS'Y, POWER SUPPLY	1	
	6			972500020	BUMPER	4	
	7			#6-32 X 1/2	SCREW, BIND HD, S.S.	4	
	8			#10-32 X 3/8	SCREW, BIND HD, S.S.	2	
	9			#6-32 X 5/16	SCREW, BIND HD, S.S.	12	
	10			#6-32 X 1/4	KEP NUT	12	

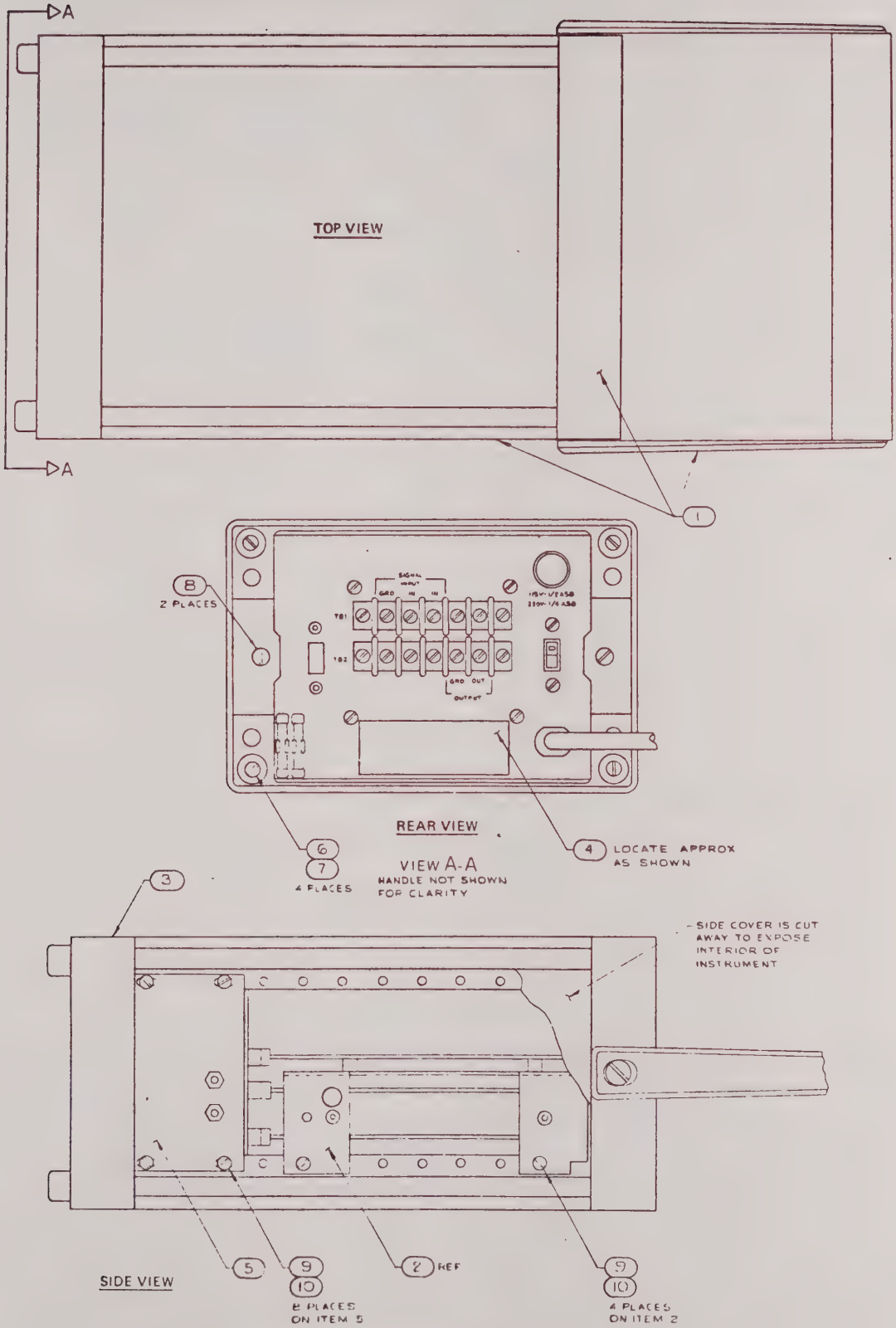


Figure 5-3. 1200B/1202B Assembly Drawing.

Table 5-4. 1200B/1202B Power Supply Chassis Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1		T.T.I.	D-P1200-041-01	ASSEMBLY, BOARD 3	1	
	2		T.T.I.	C-P1200-005-01	DECK, POWER SUPPLY	1	
	3		T.T.I.	B-P1200-045-01	SPACER	2	
	4	GFT-5	18583	972500008	TERMINAL BLOCK	2	
	5	SR5-P4	28520	972500007	STRAIN RELIEF	1	
	6	17238-B	70903	970300004	POWER CORD	1	
	7	46206-LFR	82389	971600015	SWITCH, SLIDING	1	
	8	MDL-1/2	71400	972100007	FUSE SLO-BLO 1/2 AMP	2	
	9	MDL-1/4	71400	972100006	FUSE SLO-BLO 1/4 AMP	1	
Q3,Q8 Q13	10	MJE3055	04713	961000009	TRANSISTOR MJE3055	3	
	11	HKP	71400	972200001	FUSE HOLDER	1	
	12	A1087		972200002	FUSE CLIP	2	
	13			6-32 X .38	BIND. HD. SCREW S.S.	4	
	14			6-32 X .50	BIND. HD. SCREW S.S.	7	
	15			4-40 X .50	BIND. HD. SCREW S.S.	2	
	16			6-32 X .31	KEP NUT	11	
	17			4-40 X .38	BIND. HD SCREW S.S.	2	
	18			971900005	TRANSFORMER, PWR, A-B0001-036-01	1	
	19	NO. 612		972500003	ANGLE BRACKET	2	
	20			AD43BS	POP RIVET (USM)	2	
	21			4-40 X .25	BIND. HD SCREW S.S.	2	
	22			NO. 4	SPLIT LOCKWASHER	6	

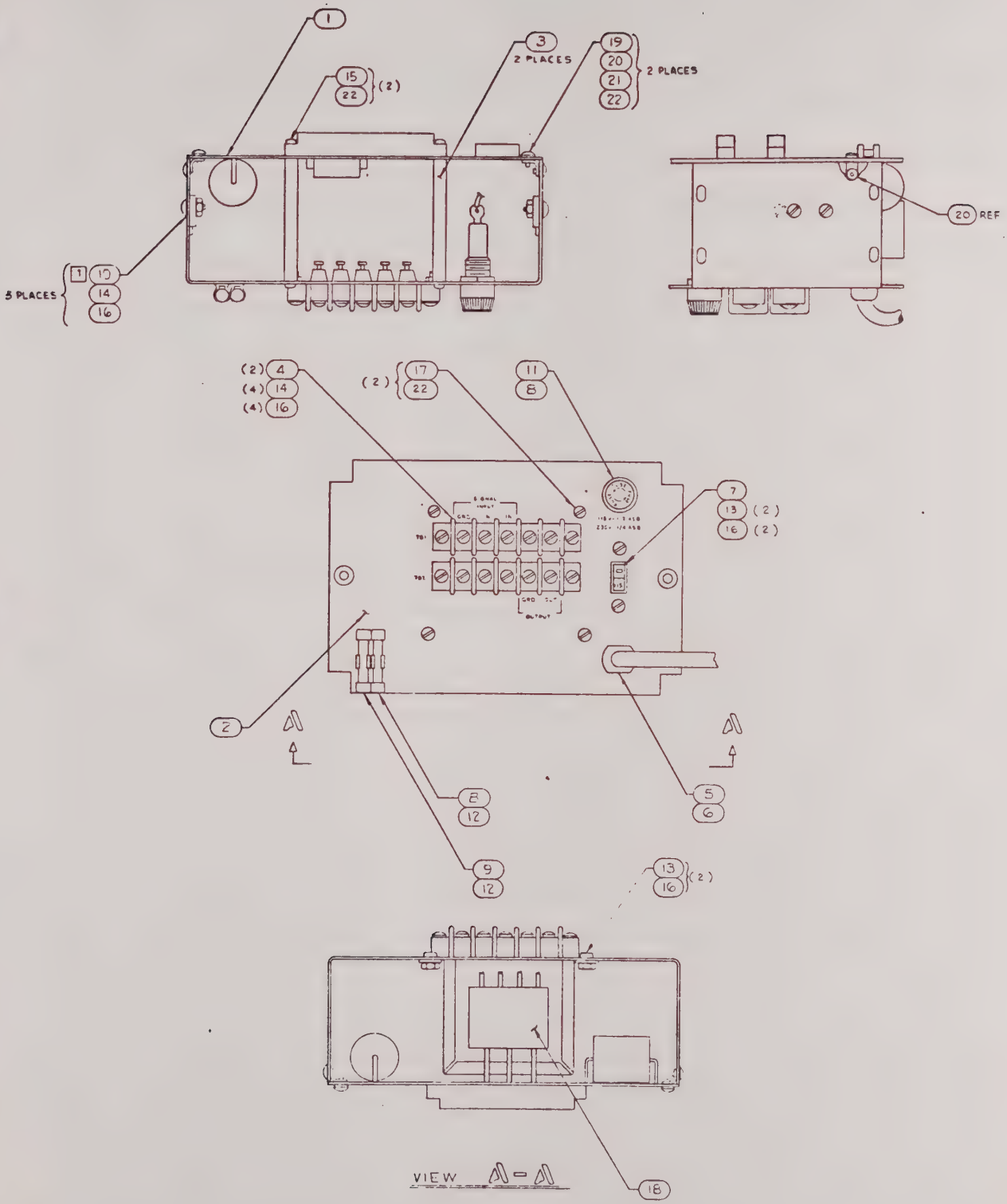


Figure 5-4. 1200B/1202B Power Supply Chassis Assembly Drawing.

Table 5-7. 1200B Chassis Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1200B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			C-P1200-001-03	PANEL, FRONT	1	
	2			D-P1200-044-01	CHASSIS	1	
	3			D-P1200-015-03	ASSEMBLY BOARD #2	1	
	4			D-P1200-013-03	ASSEMBLY BOARD #1	1	
	5			B-P1200-002-02	WINDOW	1	
	6	2J-1797	82389	972000001	JACK	3	
	7	MV5023	50522	940300003	LIGHT EMITTING DIODE	2	
	8	128		970800002	KNOB	1	
	9	X5P5896A	11237	971600039	SWITCH	1	
	10			B-P1200-010-01	ASSEMBLY, CABLE	1	
	11	7201	09353	971600012	SWITCH, TOGGLE	1	
	12	7401	09353	971600013	SWITCH, TOGGLE	1	
	13			#6-32 X 5/16	SCREW, BIND. HEAD S.S.	8	
	14			#6	STAR LOCK WASHER	8	
	15	MFF-1/8	91637	930508451	RESISTOR, METAL FILM, 8.45K, 1/8W, 1%		
	16	MFF-1/8	91637	930506190	RESISTOR, METAL FILM, 619 OHM, 1/8W, 1%		

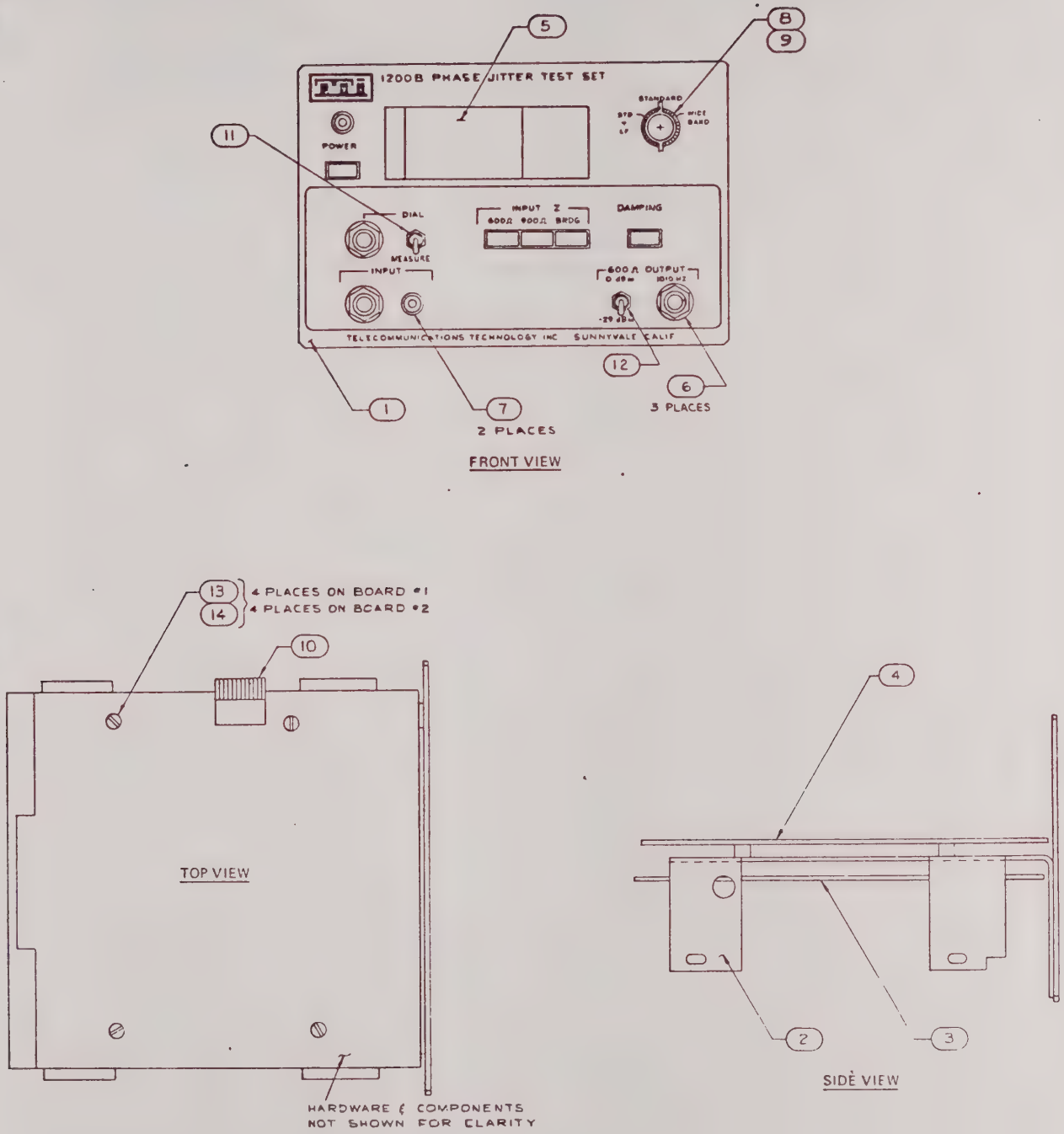


Figure 5-7. 1200B Chassis Assembly Drawing.

Table 5-5. 1201A Chassis Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			C-P1200-011-02	FRONT PANEL–SILKSCREEN	1	
	2			B-P1200-022-02	WINDOW–SILKSCREEN	1	
	3			D-P1100-002-01	CHASSIS	1	
A1	4			D-P1200-016-01	ASSY, BOARD NO. 1	1	
A2	5			D-P1200-018-01	ASSY, BOARD NO. 2	1	
	6			B-P1100-029-02	CABLE ASSY	1	
	7			970800002	KNOB	5	
54	8			971600028	SWITCH, ROTARY	1	
56	9			971600030	SWITCH, ROTARY	1	
55	10			971600029	SWITCH, ROTARY	1	
	11			930501000	RESISTOR, 100, 1%, 1/8W R1 thru R10	10	
R11	12			930501070	RESISTOR, 107, 1%, 1/8W	1	
R12	13			930502260	RESISTOR, 226, 1%, 1/8W	1	
R13	14			930502100	RESISTOR, 210, 1%, 1/8W	1	
R17	15			930503740	RESISTOR, 374, 1%, 1/8W	1	
R16	16			930501870	RESISTOR, 187, 1%, 1/8W	1	
R15	17			930510487	RESISTOR, 48.7, 1%, 1/8W	1	
R14	18			930510432	RESISTOR, 43.2, 1%, 1/8W	1	
R18	19			930502493	RESISTOR, 249K, 1%, 1/8W	1	
R20	20			930502322	RESISTOR, 23.2K, 1%, 1/8W	1	
R22	21			930502151	RESISTOR, 2.15K, 1%, 1/8W	1	

Table 5-5. 1201A Chassis Assembly Parts List (Continued)

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R21	22			930508251	RESISTOR, 8.25K, 1%, 1/8W	1	
R19	23			930508252	RESISTOR, 82.5K, 1%, 1/8W	1	
	24			#6-32 X 3/8	PAN HEAD SCREW	8	
	25			#6	SPLIT LOCKWASHER	8	
	26			GLUE	GENERAL CEMENT	A/R	
	27			22 AWG	BUSS WIRE	A/R	
	28			22 AWG	TEFLON SLEEVING	A/R	
	29			971600027	SWITCH, ROTARY	1	
	30			971600032	SWITCH, ROTARY	1	

Table 5-6. 1201A Rear Panel Assembly Parts List

ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			C-P1200-029-02	SILKSCREEN, REAR PANEL	1	
	2			971600031	SWITCH, ROTARY	1	
	3			972500008	TERMINAL BLOCK, 5 TERM.	1	
	4			#6-32 X 1/2	SCREW, BINDING HEAD, S.S.	2	
	5			#6-32 X 1/4	KEP NUT	2	
	6			930504991	RESISTOR, METAL FILM, 4.99K, 1%, 1/8W	1	
	7			930501003	RESISTOR, METAL FILM, 100K, 1%, 1/8W	1	
	8			930502003	RESISTOR, METAL FILM, 200K, 1%, 1/8W	1	
	9			930504423	RESISTOR, METAL FILM, 442K, 1%, 1/8W	1	
	10			970800002	KNOB	1	
	11			970400011	CONNECTOR, 30 PIN	1	
	12			972000001	JACK	1	
	13			#6-32 X 3/4	STANDOFF, INTERNAL THD.	2	
	14			#6-32 X 3/8	SCREW, BINDING HEAD, S.S.	4	
	15			NO. 6	LOCKWASHER, INT. TOOTH	4	

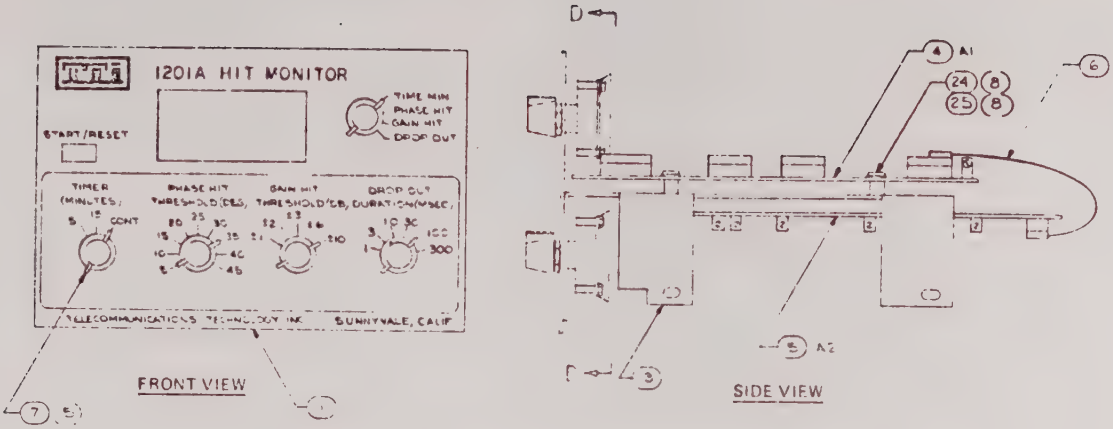


Figure 5-5a. 1201A Chassis Assembly Drawing.

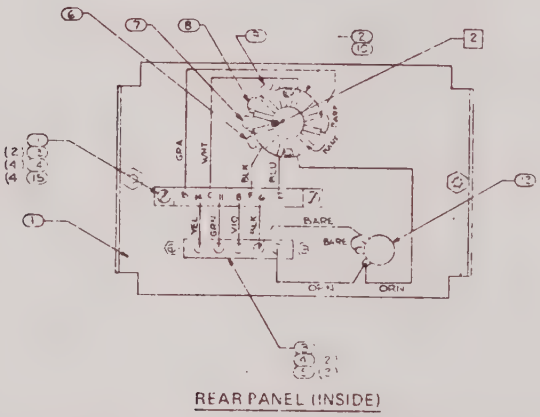


Figure 5-6. 1201A Rear Panel Assembly Drawing.

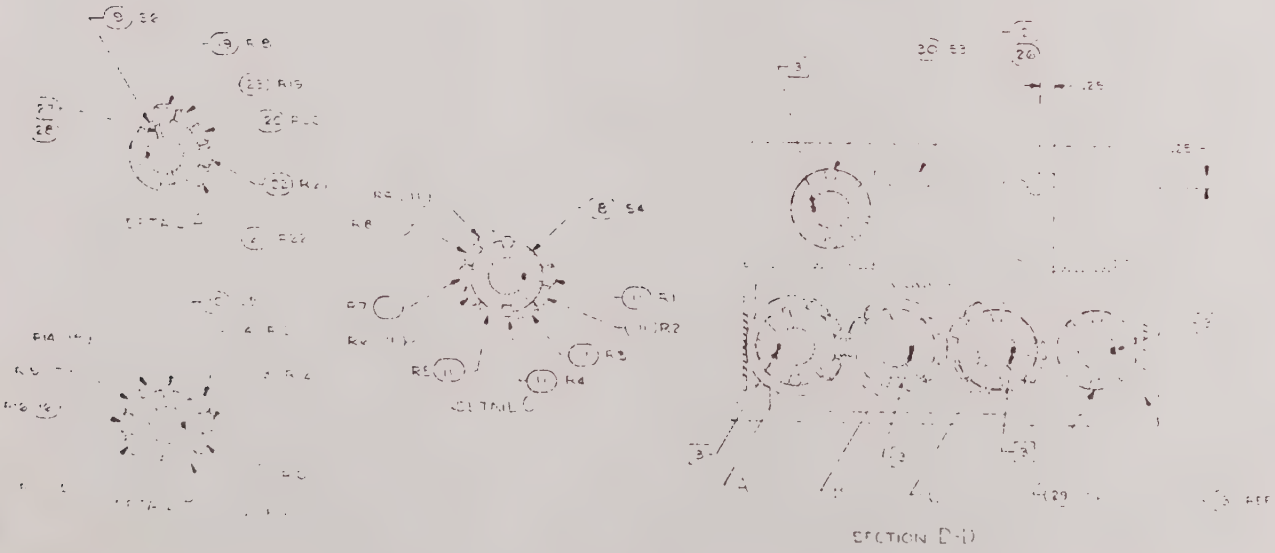


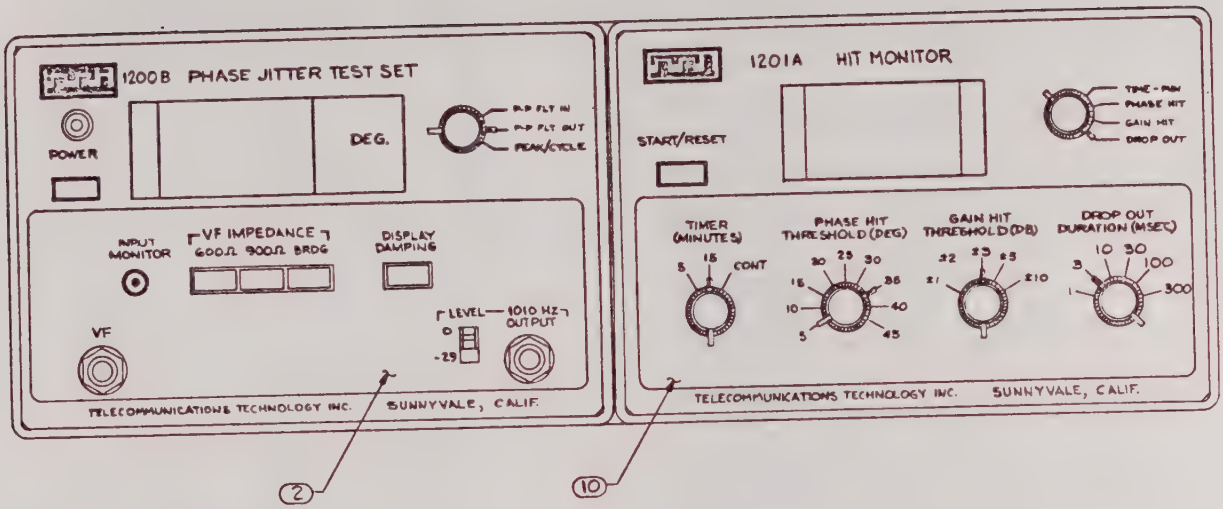
Figure 5-5b. 1201A Chassis Assembly Drawing.

Table 5-7. 1200B/1202B With 1201A Assembly Parts List

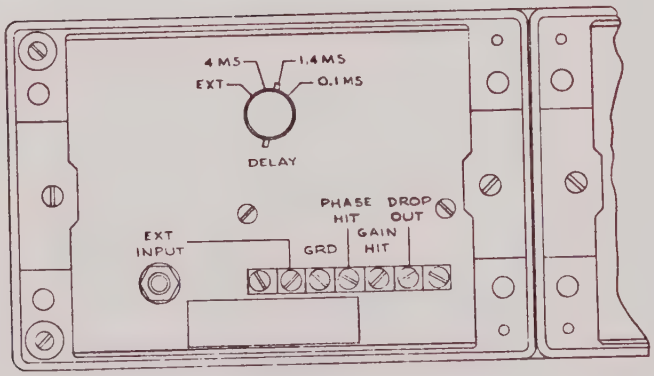
ASSEMBLY NAME:
ASSEMBLY NUMBER:
SHEET: ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1			D-P1200-026-01	ASS'Y, FRAME AND HANDLE	1	
	2			D-P1200-025-01	ASSEMBLY, CHASSIS	1	
	3			D-P1100-043-01	CASTING, REAR	2	
	4			#6-32 X 1/2	SCREW, BIND. HEAD S.S.	4	
	5			#10-32 X 3/8	SCREW, BIND. HEAD S.S.	4	
	6			972500020	BUMPER	4	
	7			D-P1200-043-01	ASSEMBLY, POWER SUPPLY	1	
	8			#6-32 X 5/16	SCREW, BIND. HEAD S.S.	24	
	9			#6-32 X 1/4	KEP NUT	24	
	10			D-P1200-027-01	ASSEMBLY, CHASSIS	1	
	11			D-P1200-028-01	ASSEMBLY, REAR PANEL	1	
	12			C-P1100-024-01	I.D. TAG, REAR PANEL	1	
	13			#22 AWG	HOOK UP WIRE, INSULATED	A/R	
	14			B-P1100-029-07	CABLE	1	
	15			B-P1100-029-08	CABLE	1	



HANDLE IS REMOVED FROM THIS VIEW FOR CLARITY



REAR VIEW

Figure 5-7. 1200B/1202B With 1201A Assembly Drawing.

Table 5-8. 1200B/1202B Input Circuit Board.

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 1 ISSUE: B
ECO: 368

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1		910200067	III. Elna	315T10	CAPACITOR, ELECTROLYTIC, 10 µF 315V	2	5
C2		910200067	III. Elna	315T10	CAPACITOR, ELECTROLYTIC, 10 µF 315V		5
C3		910500030	27556	BV2B103F	CAPACITOR, METAL POYLCARB, .01 µF, 100V, 1%	11	
C4		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C5		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C6		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C7		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C8		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C9		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C10		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C11		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C12		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C13		910500030	27556	BV2B103F	CAPACITOR, METAL POLYCARB, .01 µF, 100V, 1%		
C14		910200045	56289	196D106X 9020JA1	CAPACITOR, ELECTROLYTIC, 10 µF, 20V	3	
C15		910200045	56289	196D106X 9020JA1	CAPACITOR, ELECTROLYTIC, 10 µF, 20V		
C16		910200061	56289	196D475X 0050KA1	CAPACITOR, 4.7 µF 50V	1	
C17		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V	6	
C18		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V		
C19		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V		
C20		910200047	56289	196D225X 9025HA1	CAPACITOR, ELECTROLYTIC, 2.2 µF 25V	1	
C21		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 2 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C22		910200048	56289	196D395X 9015HA1	CAPACITOR, ELECTROLYTIC, 3.9 µF 15V 10%	1	
C23		910500019	27556	NA2B683J	CAPACITOR, MYLAR, .068 µF 100V 5%	1	
C24		910200045	56289	196D106X 9020JA1	CAPACITOR, ELECTROLYTIC, 10 µF 20V		
C25		910100002	56289	TGD–50	CAPACITOR, DISK, .005 µF 100V	1	
C26		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V		
C27		910200046	56289	196D226X 9010JA1	CAPACITOR, ELECTROLYTIC, 22 µF 10V		
C28		910500004	27556	ZA2443J	CAPACITOR, MYLAR, .27 µF 100V 5%	4	
C29		910500004	27556	ZA2443J	CAPACITOR, MYLAR, .27 µF 100V 5%		
C30		910100005	71590	UK10-104	CAPACITOR, DISK, 0.1 µF 10V	7	
C31		910500017	27556	NA2B333J	CAPACITOR, MYLAR, .033 µF 100V 5%	2	
C32		910200063	56289	196D686X 9006KA1	CAPACITOR, TANTALEX, 68 µF 6V	1	
C33		910500004	27556	ZA2443J	CAPACITOR, MYLAR, .27 µF 100V 5%		
C34		910500004	27556	ZA2443J	CAPACITOR, MYLAR, .27 µF 100V 5%		
C35		910500017	27556	NA2B333J	CAPACITOR, MYLAR, .033 µF 100V 5%		
C36		910500011	27556	ZA2B154J	CAPACITOR, MYLAR, .15 µF 100V	2	
C37		910500011	27556	ZA2B154J	CAPACITOR, MYLAR, .15 µF 100V		
C38		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 µF 20V	11	
C39		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 µF 20V		
C40		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 µF 20V		
C41		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 µF 20V		
C42		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 µF 20V		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 3 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C43		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C44		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C45		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C46		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C47		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C48		910100032	71590	UK20-104	CAPACITOR, DISK CERAMIC, 0.1 μF 20V		
C49		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C50		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C51		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C52		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C53		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C54		910100005	71590	UK10-104	CAPACITOR, DISK CERAMIC, 0.1 μF 10V		
C55		910200071	Ill. Elna	315T5	CAPACITOR, ELECTROLYTIC, 5 μF 315V	2	5
C56		910200071	Ill. Elna	315T5	CAPACITOR, ELECTROLYTIC, 5 μF 315V		5
CR1		940200017	12969	IN4736	DIODE, ZENER, IN4736	2	
CR2		940200017	12969	IN4736	DIODE, ZENER, IN4736		
CR3		940200032	03508	IN4148	DIODE, IN4148	3	
CR4		940200032	03508	IN4148	DIODE, IN4148		
CR5		940200032	03508	IN4148	DIODE, IN4148		
CR6		940200005	04713	IN5231	DIODE, ZENER, IN5231	1	

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 4 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
CR7		940200002	03877	IN825	DIODE, ZENER, IN825	1	
IC1		952000007	27014	LM311	I.C., LINEAR LM311	1	
IC2		952000013	18324	NE567V	I.C., LINEAR NE567V	1	
IC3		952000021	49956	RC4136	I.C., QUAD OP AMP, RC4136	2	
IC4		952000021	49956	RC4136	I.C., QUAD OP AMP, RC4136		
IC5					NOT USED		
IC6		950200020	01295	SN7413N	I.C., DUAL SCHMITT TRIGGER, SN7413N	2	
IC7		950200018	01295	SN7416N	I.C., HEX INVERTER, SN7416N	5	
IC8		950200020	01295	SN7413N	I.C., DUAL SCHMITT TRIGGER, SN7413N		
IC9		950200018	01295	SN7416N	I.C., HEX INVERTER, SN7416N		
IC10		950200002	01295	SN7400N	I.C., QUAD NAND GATE, SN7400N	1	
IC11		950200023	01295	SN7403N	I.C., QUAD NAND GATE, SN7403N	2	
IC12		950200018	01295	SN7416N	I.C., HEX INVERTER, SN7416N		
IC13		950200018	01295	SN7416N	I.C., HEX INVERTER, SN7416N		
IC14		952000011	27014	741CN	I.C., LINEAR, (8 PIN DIP) 741CN	4	
IC15		950200018	01295	SN7416N	I.C., HEX INVERTER, SN7416N		
IC16		950200023	01295	SN7403N	I.C., QUAD NAND GATE, SN7403N		
IC17					NOT USED		
IC18		952000011	27014	741CN	I.C., LINEAR, (8 PIN DIP) 741CN		
IC19		952000011	27014	741CN	I.C., LINEAR, (8 PIN DIP) 741CN		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 5 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC20		952000011	27014	741CN	I.C., LINEAR, (8 PIN DIP) 741CN		
IC21		950200019	01295	SN74121N	I.C., MONOSTABLE MULTIVIBRATOR, SN74121N	2	
IC22		950200019	01295	SN74121N	I.C., MONOSTABLE MULTIVIBRATOR, SN74121N		
K1		971300001	31951	101-001-6	RELAY, REED, 6V FORM C	1	
Q1		960100018	04713	MPS-A12	TRANSISTOR, DUAL-AMPLIFIER, MPS-A12	2	
Q2		960100018	04713	MPS-A12	TRANSISTOR, DUAL-AMPLIFIER, MPS-A12		
Q3		960100012	07263	2N5139	TRANSISTOR, PNP, 2N5139	2	
Q4		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134	6	
Q5		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134		
Q6		960100008	01295	2N4062	TRANSISTOR, PNP, 2N4062	5	
Q7		960100002	01295	2N3711	TRANSISTOR, NPN, 2N3711	4	
Q8		960100002	01295	2N3711	TRANSISTOR, NPN, 2N3711		
Q9		960100008	01295	2N4062	TRANSISTOR, PNP, 2N4062		
Q10		960100012	07263	2N5139	TRANSISTOR, PNP, 2N5139		
Q11		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134		
Q12		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134		
Q13		960100008	01295	2N4062	TRANSISTOR, PNP, 2N4062		
Q14		960100002	01295	2N3711	TRANSISTOR, NPN, 2N3711		
Q15		960100002	01295	2N3711	TRANSISTOR, NPN, 2N3711		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 6 ISSUE:
ECO:

TTI 1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
Q16		960100008	01295	2N4062	TRANSISTOR, PNP, 2N4062		
Q17		960100007	04713	2N5210	TRANSISTOR, NPN, 2N5210	1	
Q18		960100008	01295	2N4062	TRANSISTOR, PNP, 2N4062		
Q19		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134		
Q20		962000005	07263	2N5134	TRANSISTOR, NPN, 2N5134		
R1		930400001		KMN 500-600	RESISTOR, 600 ohms 5W .1%	1	6
R2		930400002		KMN 500-900	RESISTOR, 900 ohms 5W .1%	1	6
R3		930502492	91637	MFF-1/8	RESISTOR, METAL FILM, 24.9K 1/8W 1%	1	
R4		930502672	91637	MFF-1/8	RESISTOR, METAL FILM, 26.7K 1/8W 1%	1	
R5		930502742	91637	MFF-1/8	RESISTOR, METAL FILM, 27.4K 1/8W 1%	2	
R6		930502742	91637	MFF-1/8	RESISTOR, METAL FILM, 27.4K 1/8W 1%		
R7		930508252	91637	MFF-1/8	RESISTOR, METAL FILM, 82.5K 1/8W 1%	1	
R8		930505762	91637	MFF-1/8	RESISTOR, METAL FILM, 57.6K 1/8W 1%	1	
R9		930503092	91637	MFF-1/8	RESISTOR, METAL FILM, 30.9K 1/8W 1%	1	
R10		930506192	91637	MFF-1/8	RESISTOR, METAL FILM, 61.9K 1/8W 1%	1	
R11		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K 1/8W 1%	3	
R12		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K 1/8W 1%		
R13		930504991	91637	MFF-1/8	RESISTOR, METAL FILM, 4.99K 1/8W 1%	4	
R14		930504991	91637	MFF-1/8	RESISTOR, METAL FILM, 4.99K 1/8W 1%		
R15		930503831	91637	MFF-1/8	RESISTOR, METAL FILM, 3.83K 1/8W 1%	1	

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 7 ISSUE:
ECO:

TTi 1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R16		930501001	91637	MFF-1/8	RESISTOR, METAL FILM, 1K 1/8W 1%	2	
R17		930501001	91637	MFF-1/8	RESISTOR, METAL FILM, 1K 1/8W 1%		
R18		930502493	91637	MFF-1/8	RESISTOR, METAL FILM, 249K 1/8W 1%	1	
R19		930501182	91637	MFF-1/8	RESISTOR, METAL FILM, 11.8K 1/8W 1%	1	
R20		930502051	91637	MFF-1/8	RESISTOR, METAL FILM, 2.05K 1/8W 1%	1	
R21		930501372	91637	MFF-1/8	RESISTOR, METAL FILM, 13.7K 1/8W 1%	3	
R22		930501372	91637	MFF-1/8	RESISTOR, METAL FILM, 13.7K 1/8W 1%		
R23		930501372	91637	MFF-1/8	RESISTOR, METAL FILM, 13.7K 1/8W 1%		
R24		930501822	91637	MFF-1/8	RESISTOR, METAL FILM, 18.2K 1/8W 1%	1	
R25		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN, 10K	5	
R26		930506191	91637	MFF-1/8	RESISTOR, METAL FILM, 6.19K 1/8W 1%	2	
R27		930501022	91637	MFF-1/8	RESISTOR, METAL FILM, 10.2K 1/8W 1%	3	
R28		930501022	91637	MFF-1/8	RESISTOR, METAL FILM, 10.2K 1/8W 1%		
R29		930501022	91637	MFF-1/8	RESISTOR, METAL FILM, 10.2K 1/8W 1%		
R30		930502873	91637	MFF-1/8	RESISTOR, METAL FILM, 287K 1/8W 1%	2	
R31		930504990	91637	MFF-1/8	RESISTOR, METAL FILM, 499 Ohms 1/8W 1%	1	
R32		930502873	91637	MFF-1/8	RESISTOR, METAL FILM, 287K 1/8W 1%		
R33		930501501	91637	MFF-1/8	RESISTOR, METAL FILM, 1.5K 1/8W 1%	1	
R34		930504320	91637	MFF-1/8	RESISTOR, METAL FILM, 432 OHMS ± 1/8W, 1%	1	
R35		930700473	01121	JANRCR07	RESISTOR, COMPOSITION, 47K 1/4W 5%	1	
R36		930700391	01121	JANRCR07	RESISTOR, COMPOSITION, 390 OHMS 1/4W 5%	2	

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 8 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R37		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%	12	
R38		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R39		930700104	01121	JANRCR07	RESISTOR, COMPOSITION, 100K 1/4W 5%	1	
R40		930700271	01121	JANRCR07	RESISTOR, COMPOSITION, 270 Ohms 1/4W 5%	1	
R41		930700391	01121	JANRCR07	RESISTOR, COMPOSITION, 390 Ohms 1/4W 5%		
R42		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN 10K		
R43		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K 1/8W 1%		
R44		930700683	01121	JANRCR07	RESISTOR, COMPOSITION, 68K 1/4W 5%	1	
R45		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R46		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R47		930501211	91637	MFF-1/8	RESISTOR, METAL FILM, 1.21K 1/8W 1%	1	
R48		930700471	01121	JANRCR07	RESISTOR, COMPOSITION, 470 Ohms 1/4W 5%	1	
R49		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN, 10K		
R50		930700123	01121	JANRCR07	RESISTOR, COMPOSITION, 12K 1/4W 5%	1	
R51		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%	6	
R52		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%		
R53		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%	7	
R54		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R55		930700102	01121	JANRCR07	RESISTOR, COMPOSITION, 1K 1/4W 5%	5	
R56		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R57		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 9 ISSUE:
ECO:

TTI 1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R58		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R59		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN, 10K		
R60		930504993	91637	MFF-1/8	RESISTOR, METAL FILM, 499K 1/8W 1%	4	
R61		930504993	91637	MFF-1/8	RESISTOR, METAL FILM, 499K 1/8W 1%		
R62		930508871	91637	MFF-1/8	RESISTOR, METAL FILM, 8.87K 1/8W 1%	1	
R63		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%		
R64		930505761	91637	MFF-1/8	RESISTOR, METAL FILM, 5.76K 1/8W 1%	4	
R65		930505621	91637	MFF-1/8	RESISTOR, METAL FILM, 5.62K 1/8W 1%	2	
R66		930505761	91637	MFF-1/8	RESISTOR, METAL FILM, 5.76K 1/8W 1%		
R67		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%		
R68		930900181	01121	JANRCR32	RESISTOR, COMPOSITION, 180 Ohms 1W 5%	1	
R69		930501181	91637	MFF-1/8	RESISTOR, METAL FILM, 1.18K 1/8W 1%	1	
R70		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN, 10K		
R71		930506191	91637	MFF-1/8	RESISTOR, METAL FILM, 6.19K 1/8W 1%		
R72		930700102	01121	JANRCR07	RESISTOR, COMPOSITION, 1K 1/4W 5%		
R73		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R74		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R75		920200503	02111	43P503	RESISTOR, VARIABLE, MULTI-TURN, 50K	1	
R76		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R77		930504993	91637	MFF-1/8	RESISTOR, METAL FILM, 499K 1/8W 1%		
R78		930504993	91637	MFF-1/8	RESISTOR, METAL FILM, 499K 1/8W 1%		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 10 ISSUE:
ECO:

1200/1202B PARTS LIST

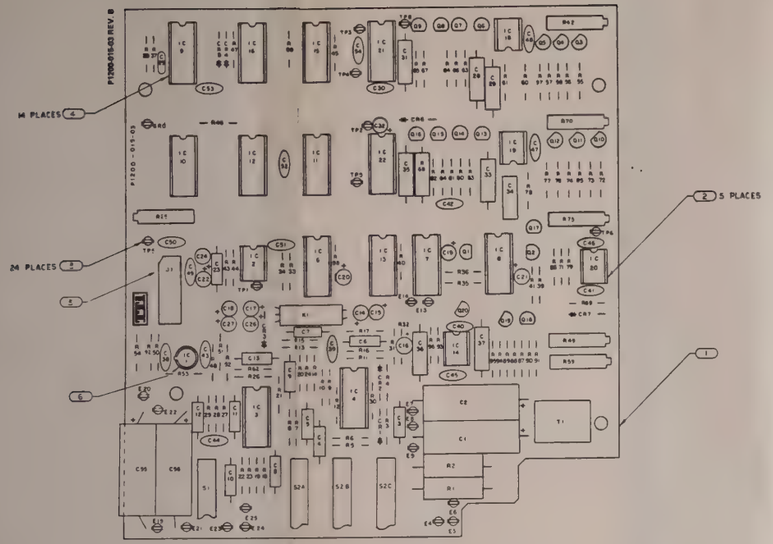
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R79		930503741	91637	MFF-1/8	RESISTOR, METAL FILM, 3.74K 1/8W 1%	1	
R80		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%		
R81		930505761	91637	MFF-1/8	RESISTOR, METAL FILM, 5.76K 1/8W 1%		
R82		930505621	91637	MFF-1/8	RESISTOR, METAL FILM, 5.62K 1/8W 1%		
R83		930505761	91637	MFF-1/8	RESISTOR, METAL FILM, 5.76K 1/8W 1%		
R84		930700562	01121	JANRCR07	RESISTOR, COMPOSITION, 5.6K 1/4W 5%		
R85		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R86		930502743	91637	MFF-1/8	RESISTOR, METAL FILM, 274K 1/8W 1%	1	
R87		930700102	01121	JANRCR07	RESISTOR, COMPOSITION, 1K 1/4W 5%		
R88		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R89		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R90		930700102	01121	JANRCR07	RESISTOR, COMPOSITION, 1K 1/4W 5%		
R91		930700102	01121	JANRCR07	RESISTOR, COMPOSITION, 1K 1/4W 5%		
R92		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R93		930504991	91637	MFF-1/8	RESISTOR, METAL FILM, 4.99K 1/8W 1%		
R94		930504991	91637	MFF-1/8	RESISTOR, METAL FILM, 4.99K 1/8W 1%		
R95		930501004	91637	MFF-1/8	RESISTOR, METAL FILM, 1M 1/8W 1%	2	
R96		930501004	91637	MFF-1/8	RESISTOR, METAL FILM, 1M 1/8W 1%		
R97		930700272	01121	JANRCR07	RESISTOR, COMPOSITION, 2.7K 1/4W 5%		
R98		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		
R99		930700332	01121	JANRCR07	RESISTOR, COMPOSITION, 3.3K 1/4W 5%		

Table 5-8. 1200B/1202B Input Circuit Board. (Cont.)

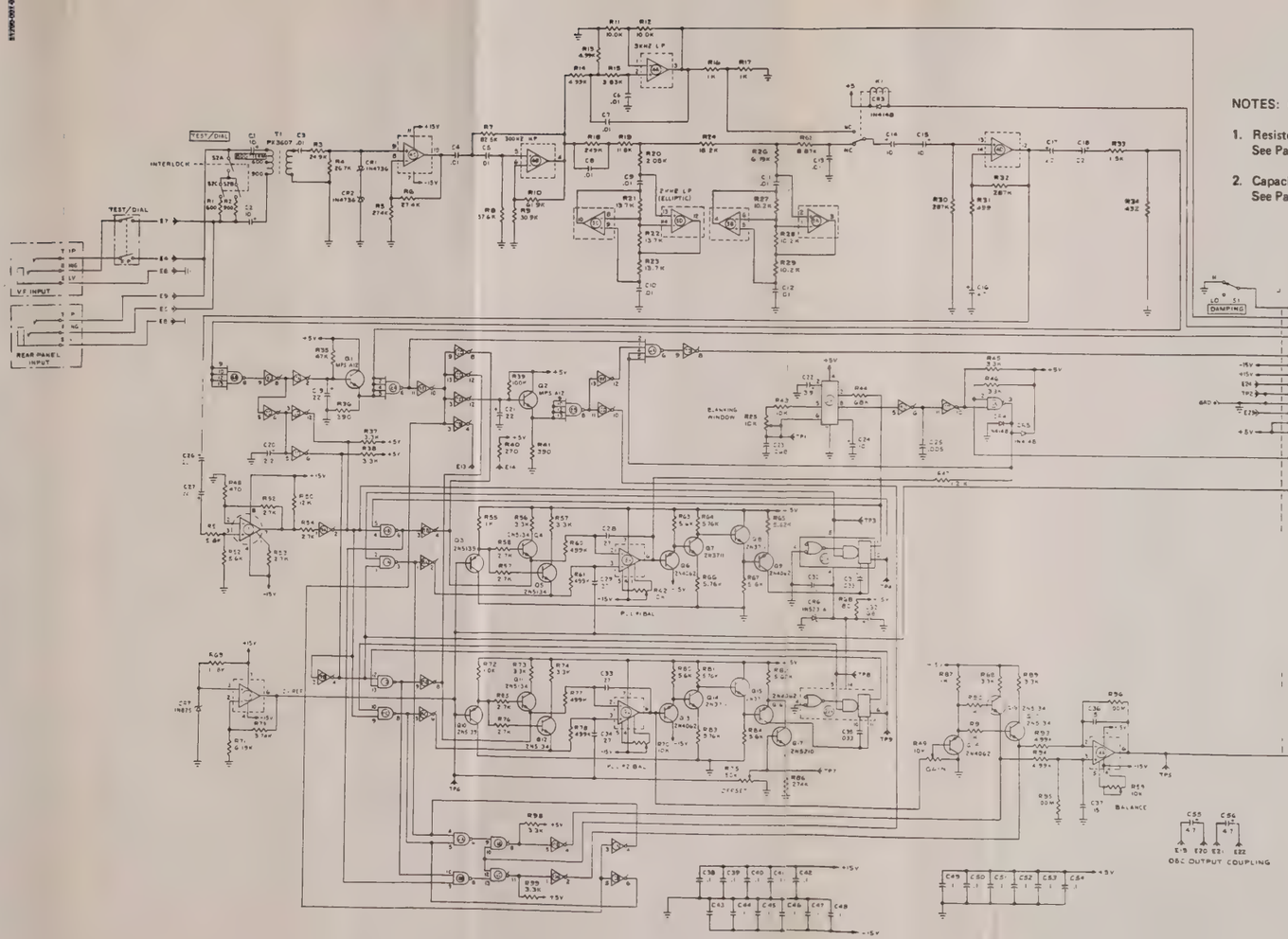
ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-015-03
SHEET: 11 ISSUE:
ECO:

TTi 1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
S1		971600001	31918	FSB/BLK2UEE	SWITCH, 2 PDT	1	
S2		971600026	31918	3XF15SB/BLK 2UGR	SWITCH, 2 PDT 3 STATION	1	
T1		971900022	05216	PX3607	TRANSFORMER, B0001-057-01	1	
	1	P1200-014-03	TTI	P1200-014-03	PRINTED CIRCUIT BOARD, REV B	1	
	2	971400007	00779	583640-1	IC SOCKET, 8 PIN DIP	5	
	3	971200005	00779	86147-2	TERMINAL, STAKE	24	
	4	971400001	71785	14 D.I.P.	SOCKET, INT. CKT, 14 PIN DIP	14	
	5	971400002	71785	16 D.I.P.	SOCKET, INT. CKT, 16 PIN DIP	1	
	6	971400006	71785	8 ICS	SOCKET, INT. CKT, 8 PIN ROUND	1	



Component Locating Diagram
TTI 1200B/1202B Input Circuit Board



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. Resistor values are expressed in ohms. See Parts List for tolerance and wattage.
2. Capacitor values are expressed in microfarads. See Parts List for voltage.

I.C Table				
I.C Ref Des	Device Type	Pin Conn Vcc	Pin Conn Grd	Bypass Capacitor Ref Des
IC1, IC2	RC4136DP	–	–	C38, C43, C51
IC3	LM311	–	1	C44
IC4	NE567V	–	7	C39
IC6, IC8	SN7413N	14	7	
IC7, IC9 IC12, IC13, IC15	SN7416N	14	7	C52, C53, C54
IC10	SN7400N	14	7	C50
IC11, IC16	SN7403N	14	7	
IC14, IC18, IC19, IC20	SN72741P	–	–	C41, C46, C47, C48, C40, C45
IC21, IC22	SN74121N	14	7	C30, C42

Ref Des	
Last Used	Not Used
C56	
CR7	
E24	E1, E2, E3, E10, E11, E12, E15, E16, E17, E18
IC22	IC5, IC17
J1	
K1	
Q20	
R99	
S2	
T1	
TP9	

1200B/1202B INPUT CIRCUIT BOARD SCHEMATIC

A

Table 5-9. 1200B/1202B Output and Display Circuit Board.

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 1 ISSUE: A
ECO: 338

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1		910500016	27556	NA2B273J	CAPACITOR, MYLAR, .027 µF 5% 100V	1	
C2		910500029	27556	BA2B273F	CAPACITOR, MET. POLYCARB, .027 µF 1% 100V	4	
C3		910500029	27556	BA2B273F	CAPACITOR, MET. POLYCARB, .027 µF 1% 100V		
C4		910500029	27556	BA2B273F	CAPACITOR, MET. POLYCARB, .027 µF 1% 100V		
C5		910200045	56289	196D106X 9020JAI	CAPACITOR, ELECTROLYTIC, 10 µF, 20V	2	
C6		910200045	56289	196D106X 9020JAI	CAPACITOR, ELECTROLYTIC, 10 µF 20V		
C7		910500028	27556	BA2B224F	CAPACITOR, MET. POLYCARB, .22 µF 1% 100V	3	
C8		910500028	27556	BA2B224F	CAPACITOR, MET. POLYCARB, .22 µF 1% 100V		
C9		910500028	27556	BA2B224F	CAPACITOR, MET. POLYCARB, .22 µF 1% 100V		
C10		910200061	56289	196D475X 0050KAI	CAPACITOR, ELECTROLYTIC, 4.7 µF 50V	2	
C11		910200061	56289	196D475X 0050KAI	CAPACITOR, ELECTROLYTIC, 4.7 µF 50V		
C12		910500029	27556	BA2B273F	CAPACITOR, MET. POLYCARB, .027 µF 1% 100V		
C13		910500027	27556	BA2C222J	CAPACITOR, POLYCARB, 2200PF 200V	1	
C14		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 µF 25V	10	
C15		910500030	27556	BV2B103F	CAPACITOR, POLYCARB, .01 µF 1% 100V	2	
C16		910500030	27556	BV2B103F	CAPACITOR, POLYCARB, .01 µF 1% 100V		
C17		910100003	71590	CK-103	CAPACITOR, CERAMIC DISC, .01 µF 50V	2	
C18		910100003	71590	CK-103	CAPACITOR, CERAMIC DISC, .01 µF 50V		
C19		910100002	56289	TGD-50	CAPACITOR, CERAMIC DISC, .005 µF 100V	1	
C20					NOT USED		
C21					NOT USED		

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 2 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C22		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C23		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C24		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C25		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C26		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C27		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C28		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C29		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C30		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISC, .05 μF 25V		
C31		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISC, .1 μF 10V	5	
C32		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISC, .1 μF 10V		
C33		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISC, .1 μF 10V		
C34		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISC, .1 μF 10V		
C35		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISC, .1 μF 10V		
C36		910500019	27556	NA2B683J	CAPACITOR, MYLAR, .068 μF 100V	1	
CR1		940200032	03508	IN4148	DIODE, IN4148	5	
CR2		940200032	03508	IN4148	DIODE, IN4148		
CR3		940200032	03508	IN4148	DIODE, IN4148		
CR4		940200032	03508	IN4148	DIODE, IN4148		
CR5		940200032	03508	IN4148	DIODE, IN4148		

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 3 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC1		952000020	37327	MI1458	I.C. MI1458	1	
IC2		952000021	49956	RC4136	I. C. RC4136	3	
IC3		952000021	49956	RC4136	I. C. RC4136		
IC5		952000021	49956	RC4136	I. C. RC4136		
IC9		952000011	27014	SN72741P	I. C. SN72741P	1	
IC11		950300001	18324	SP301A	I. C. UTILOGIC, SIGNETIC, SP301A	1	
IC13		950200019	01295	SN74121N	I. C. SN74121N	1	
IC14		950200020	01295	SN7413N	I. C. SN7413N	1	
IC15		950200002	01295	SN7400N	I. C. SN7400N	1	
IC16		950200004	01295	SN7404N	I. C. SN7404N	1	
IC21		950200010	01295	SN7490N	I. C. SN7490N	6	
IC22		950200010	01295	SN7490N	I. C. SN7490N		
IC23		950200021	01295	SN7492N	I. C. SN7492N	1	
IC24		950200010	01295	SN7490N	I. C. SN7490N		
IC25		950200010	01295	SN7490N	I. C. SN7490N		
IC26		950200010	01295	SN7490N	I. C. SN7490N		
IC27		950200008	01295	SN7475N	I. C. SN7475N	3	
IC28		950200008	01295	SN7475N	I. C. SN7475N		
IC29		950200008	01295	SN7475N	I. C. SN7475N		
IC30		950200015	01295	SN74141N	I. C. SN74141N	3	
IC31		950200015	01295	SN74141N	I. C. SN74141N		

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 4 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC32		950200015	01295	SN74141N	I. C. SN74141N		
IC33		950200010	01295	SN7490N	I. C. SN7490N		
IC34		950200014	27014	SN74107N	I. C. SN74107N	1	
NX1		971800001	83594	B5870S	NIXIE TUBE, BURROUGHS B5870S	3	
NX2		971800001	83594	B5870S	NIXIE TUBE, BURROUGHS B5870S		
NX3		971800001	83594	B5870S	NIXIE TUBE, BURROUGHS B5870S		
Q1		960100004	04713	2N5087	TRANSISTOR, 2N5087	1	
Q2		960100007	04713	2N5210	TRANSISTOR, 2N5210	3	
Q3		962000004	27014	2N5140	TRANSISTOR, 2N5140	1	
Q4		962000005	07263	2N5134	TRANSISTOR, 2N5134	2	
Q5		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q6		960100007	04713	2N5210	TRANSISTOR, 2N5210		
Q7		960100007	04713	2N5210	TRANSISTOR, 2N5210		
Q8		960100015	04713	MM3002	TRANSISTOR, MM3002	1	
Q9		960100016	04713	MM4002	TRANSISTOR, MM4002	1	
Q10		960100003	07263	2N4945	TRANSISTOR, 2N4945	1	
R1		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%	9	
R2		930508252	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 82.5K 1/8W 1%	1	

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 5 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R3		930501102	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 11.0K 1/8W 1%	1	
R4		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		
R5		930502152	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 21.5K 1/8W 1%	1	
R6		930501003	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 100K 1/8W 1%	3	
R7		930504992	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 49.9K 1/8W 1%	3	
R8		930501182	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 11.8K 1/8W 1%	1	
R9		930505232	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 52.3K 1/8W 1%	1	
R10		930501503	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 150K 1/8W 1%	1	
R11		930507502	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 75.0K 1/8W 1%	1	
R12		930503482	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 34.8K 1/8W 1%	3	
R13		930503482	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 34.8K 1/8W 1%		
R14		930504642	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 46.4K 1/8W 1%	4	
R15		930504642	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 46.4K 1/8W 1%		
R16		930504642	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 46.6K 1/8W 1%		
R17		930504642	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 46.4K 1/8W 1%		
R18		930504752	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 47.5K 1/8W 1%	1	
R19		920200102	02111	43P102	RESISTOR, VARIABLE, MULTI-TURN 1K	1	
R20		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		
R21		930504022	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 40.2K 1/8W 1%	1	
R22		930504422	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 44.2K 1/8W 1%	3	
R23		930505492	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 54.9K 1/8W 1%	2	

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 6 ISSUE:
ECO:

TTI 1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R24		930505492	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 54.9K 1/8W 1%		
R25		930501502	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 15.0K 1/8W 1%	2	
R26		930501210	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 121 Ohm 1/8W 1%	2	
R27		930503482	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 34.8K 1/8W 1%		
R28		930501210	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 121 Ohm 1/8W 1%		
R29		930501502	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 15.0K 1/8W 1%		
R30		930504992	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 49.9K 1/8W 1%		
R31		930504992	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 49.9K 1/8W 1%		
R32		930501003	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 100K 1/8W 1%		
R33		930501003	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 100K 1/8W 1%		
R34		930503651	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 3.65K 1/8W 1%	1	
R35		920200103	02111	43P103	RESISTOR, VARIABLE, MULTI-TURN 10K	1	
R36		930502002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 20K 1/8W 1%	1	
R37		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10K 1/8W 1%		
R38		930502211	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 2.21K 1/8W 1%	1	
R39		930700332	01121	JANRCR07	RESISTOR, COMP, 3.3K 1/4W 5%	2	
R40		930700332	01121	JANRCR07	RESISTOR, COMP, 3.3K 1/4W 5%		
R41		930700122	01121	JANRCR07	RESISTOR, COMP, 1.2K 1/4W 5%	2	
R42		920200202	02111	43P202	RESISTOR, VARIABLE, MULTI-TURN 2K	1	
R43		930503092	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 30.9K 1/8W 1%	1	
R44		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 7 ISSUE:
ECO:

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R45		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		
R46		930508253	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 825K 1/8W 1%	1	
R47		930501582	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 15.8K 1/8W 1%	1	
R48		930700122	01121	JANRCR07	RESISTOR, COMP, 1.2K 1/4W 5%		
R49		930501472	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 14.7K 1/8W 1%	1	
R50		920200201	02111	43P201	RESISTOR, VARIABLE, MULTI-TURN, 200 OHMS	1	
R51		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		
R52		930504422	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 44.2K 1/8W 1%		
R53		930504422	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 44.2K 1/8W 1%		
R54		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10.0K 1/8W 1%		
R55		930507151	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 7.15K 1/8W 1%	1	
R56		930700561	01121	JANRCR07	RESISTOR, COMP, 560 OHM 1/4W 5%	3	
R57		930700222	01121	JANRCR07	RESISTOR, COMP, 2.2K 1/4W 5%	2	
R58		930700561	01121	JANRCR07	RESISTOR, COMP, 560 OHM 1/4W 5%		
R59		930700222	01121	JANRCR07	RESISTOR, COMP, 2.2K 1/4W 5%		
R60		930506040	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 604 OHM 1/8W 1%	1	
R61		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%	6	
R62		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%		
R63		930700561	01121	JANRCR07	RESISTOR, COMP, 560 OHM 1/4W 5%		
R64		930700182	01121	JANRCR07	RESISTOR, COMP, 1.8K 1/4W 5%	1	
R65		930700912	01121	JANRCR07	RESISTOR, COMP, 9.1K 1/4W 5%	1	

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200-013-03
SHEET: 8 ISSUE:
ECO:

1200/1202B PARTS LIST

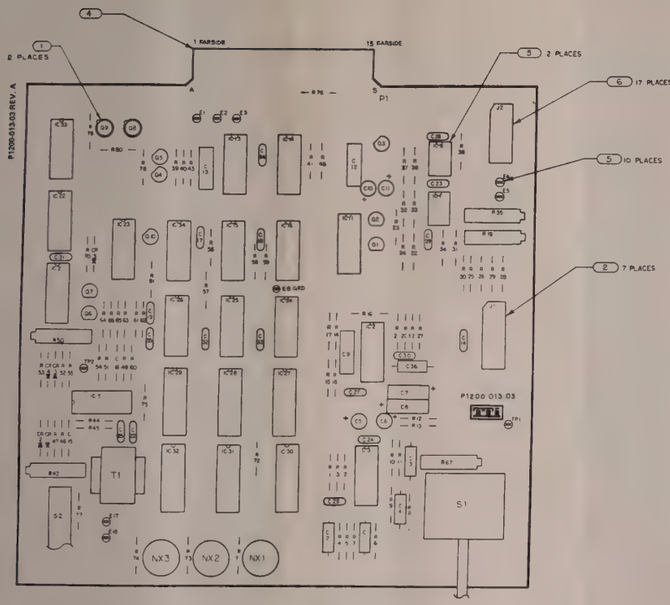
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R66		930700123	01121	JANRCR07	RESISTOR, COMP, 12K 1/4W 5%	1	
R67		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K	1	
R68					NOT USED		
R69					NOT USED		
R70		930700472	01121	JANRCR07	RESISTOR, COMP, 4.7K 1/4W 5%	1	
R71		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%		
R72		930700124	01121	JANRCR07	RESISTOR, COMP, 120K 1/4W 5%	2	
R73		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%		
R74		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%		
R75		930700124	01121	JANRCR07	RESISTOR, COMP, 120K 1/4W 5%		
R76		930700103	01121	JANRCR07	RESISTOR, COMP, 10K 1/4W 5%		
R77		930700271	01121	JANRCR07	RESISTOR, COMP, 270 OHM 1/4W 5%	1	
R78		930700562	01121	JANRCR07	RESISTOR, COMP, 5.6K 1/4W 5%	2	
R79		930501002	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 10K 1/8W 1%		
R80		930700184	01121	JANRCR07	RESISTOR, COMP, 180K 1/4W 5%	1	
R81		930700562	01121	JANRCR07	RESISTOR, COMP, 5.6K 1/4W 5%		
R82		930502003	91637	MFF-1/8-T1	RESISTOR, METAL FILM, 200K 1/8W 1%	1	
S1		971600039	11237	X5P5896A	SWITCH, ROTARY 3 POS., 4P	1	
S2		971600001	31918	FSB/BLK2UEE	SWITCH, PUSH BUTTON DPDT	1	
T1		971900022	05216	PX3607	TRANSFORMER (PX3607)	1	

Table 5-9. 1200B/1202B Output and Display Circuit Board. (Cont.)

ASSEMBLY NAME: OUTPUT & DISPLAY CIR BOARD
ASSEMBLY NUMBER: P1200 013-03
SHEET: 9 ISSUE:
ECO:

TTi 1200/1202B PARTS LIST

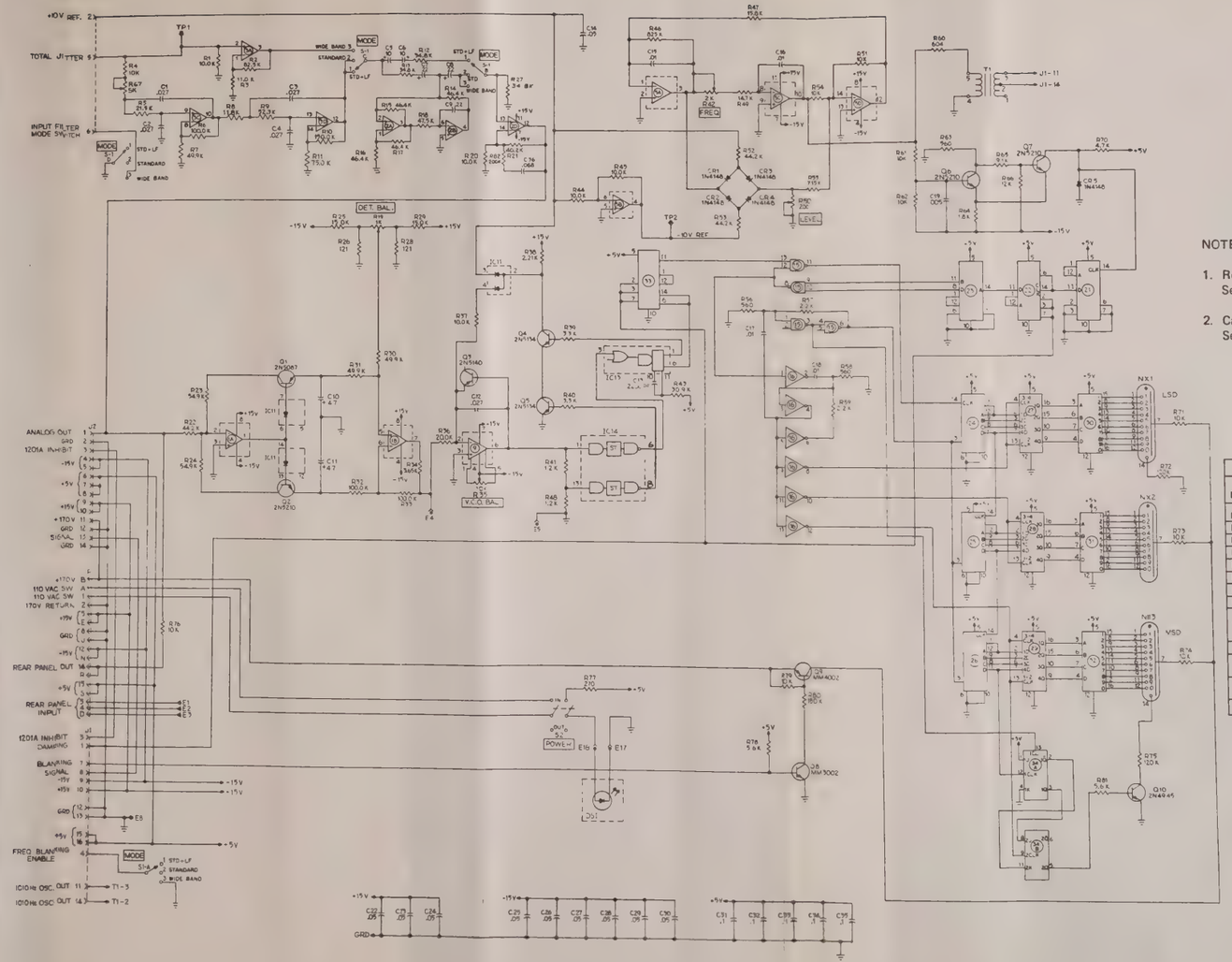
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1	971100002	K1935	T05-003	PAD, TRANSISTOR MTG	2	
	2	971400002	71785	16 D.I.P.	I. C. SOCKET, 16 PIN DIP	7	
	3	971400007	00779	583640-1	I. C. SOCKET, 8 PIN DIP	2	
	4	P1200-012-03	TTI	P1200-013-03	PRINTED CIRCUIT BOARD, REV C	1	
	5	971200005	00779	86147-2	TERMINAL	10	
	6	971400001	71785	14 DIP	IC SOCKET, 14 PIN DIP	17	



Component Locating Diagram
TTI 1200B/1202B Output and Display Circuit Board

NOTES:

1. Reference Schematic D-S1200-002-02.
2. Assemble and solder per TTI Standard Practices and Procedures Manual.
3. Board to be tested per TTI Spec. No. A-B0001-011-01.
4. Conformal coat both sides using 2 coats of 642, type 3, clear acrylic lacquer per WECO Spec. WL-2243 or equivalent. Terminals and component adjscrews shall not be coated.



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. Resistor values are expressed in ohms. See Parts List for tolerance and wattage.
2. Capacitor values are expressed in microfarads. See Parts List for voltage.

I.C. Table				
I.C. Ref Des	Device Type	Pin Conn Vcc	Pin Conn Grd	Bypass Capacitor Ref Des
IC1	MI1458	–	–	C22, C23, C24, C25, C26, C27, C28, C29, C30, C31
IC2,IC3,IC5	RC4136			
IC9	SN72741P			
IC11	SP301A	8	1	
IC13	SN74121	14	7	C34
IC14	SN7413	14	7	
IC15	SN7400	14	7	
IC16	SN7404	14	7	
IC21, IC22, IC24, IC25, IC26, IC33	SN7490	5	10	C32, C33
IC23	SN7492	5	10	
IC27, IC28, IC29	SN7475	5	12	
IC30, IC31, IC32	SN74141	5	12	
IC34	SN74107	14	7	

Ref Des	
Last Used	Not Used
C36	C20, C21
CR5	
IC34	IC4,IC6,IC7,IC8, IC10,IC12,IC17, IC18,IC19,IC20.
NX3	
Q10	
R82	R68, R69
S2	
T1	
E18	E6,E7,E9,E10,E11, E12,E13,E14,E15,E16
TP2	

1200B/1202B OUTPUT and DISPLAY CIRCUIT BOARD SCHEMATIC

TTI

B

Table 5-10. 1200B/1202B Power Supply Circuit Board.

ASSEMBLY NAME: POWER SUPPLY CIR BOARD
ASSEMBLY NUMBER: P1200-041-01
SHEET: 1 ISSUE: C
ECO: 384

1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1		910200059	90201	B41010-500/50/ 8212	CAPACITOR, 500 µF, 50V	2	
C2		910200059	90201	B41010-500/50/ 8212	CAPACITOR, 500 µF, 50V		
C3		910200021	56289	39D508G 010HP4	CAPACITOR, 500 µF, 10V	1	
C4		910200067		315-T10	CAPACITOR, 10 µF, 315V	1	
C5		910700003	34553	C280AE/A47K	CAPACITOR, .047 µF, 250V	2	
C6		910700003	34553	C280AE/A47K	CAPACITOR, .047 µF, 250V		
C7					NOT USED		
C8		910200014	56289	500D157G 016DD7	CAPACITOR, 150 µF, 16V	1	
C9		910200016	56289	500D207G 006DC7	CAPACITOR, 200 µF, 6V	1	
CR1		940200008	04713	MDA940A-2	DIODE, MDA940A-2	2	
CR2		940200032	03508	IN4148	DIODE, IN4148	2	
CR3		940200032	03508	IN4148	DIODE, IN4148		
CR4		940200008	04713	MDA940A-2	DIODE, MDA940A-2		
CR5		940200018	03877	IN4001	DIODE, IN4001	2	
CR6		940200009	04713	MDA940A-6	DIODE, MDA940A-6	1	
CR7		940200018	03877	IN4001	DIODE, IN4001		
R1		930700153	01121	JANRCR07	RESISTOR, 15K, 1/4W, 5%	1	
R2		930700562	01121	JANRCR07	RESISTOR, 5.6K, 1/4W, 5%	3	
R3		930504421	91637	MFF-1/8	RESISTOR, 4.42K, 1/8W, 1%	2	

Table 5-10. 1200B/1202B Power Supply Circuit Board. (Cont.)

ASSEMBLY NAME: POWER SUPPLY CIR BOARD
ASSEMBLY NUMBER: P1200-041-01
SHEET: 2 ISSUE:
ECO:

TTi 1200/1202B PARTS LIST

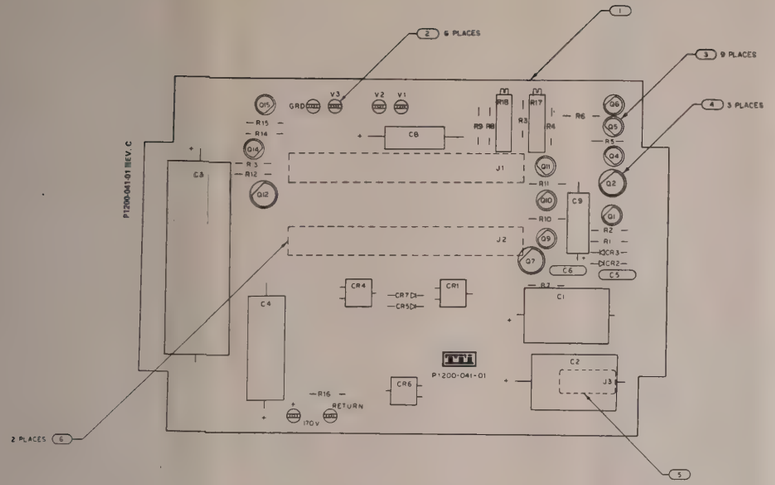
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R4		930505621	91637	MFF-1/8	RESISTOR, 5.62K, 1/8W, 1%	2	
R5		930700273	01121	JANRCR07	RESISTOR, 27K, 1/4W, 5%	2	
R6		930700562	01121	JANRCR07	RESISTOR, 5.6K, 1/4W, 5%		
R7		930700913	01121	JANRCR07	RESISTOR, 91K, 1/4W, 5%	1	
R8		930504421	91637	MFF-1/8	RESISTOR, 4.42K, 1/8W, 1%		
R9		930505621	91637	MFF-1/8	RESISTOR, 5.62K, 1/8W, 1%		
R10		930700273	01121	JANRCR07	RESISTOR, 27K, 1/4W, 5%		
R11		930700562	01121	JANRCR07	RESISTOR, 5.6K, 1/4W, 5%		
R12		930700333	01121	JANRCR07	RESISTOR, 33K, 1/4W, 5%	2	
R13		930504991	91637	MFF-1/8	RESISTOR, 4.99K, 1/8W, 1%	1	
R14		930501502	91637	MFF-1/8	RESISTOR, 15.0K, 1/8W, 1%	1	
R15		930700333	01121	JANRCR07	RESISTOR, 33K, 1/4W, 5%		
R16		930700184	01121	JANRCR07	RESISTOR, 180K, 1/4W, 5%	1	
R17		920200502	02111	43P502	RESISTOR, (POT) 5K	2	
R18		920200502	02111	43P502	RESISTOR, (POT) 5K		
Q1		962000008	07263	2N5138	TRANSISTOR, 2N5138	1	
Q2		962000006	07263	2N5135	TRANSISTOR, 2N5135	3	
Q3					NOT USED		
Q4		962000002	07263	2N3565	TRANSISTOR, 2N3565	6	
Q5		962000002	07263	2N3565	TRANSISTOR, 2N3565		

Table 5-10. 1200B/1202B Power Supply Circuit Board. (Cont.)

ASSEMBLY NAME: POWER SUPPLY CIR BOARD
ASSEMBLY NUMBER: P1200-041-01
SHEET: 3 ISSUE:
ECO:

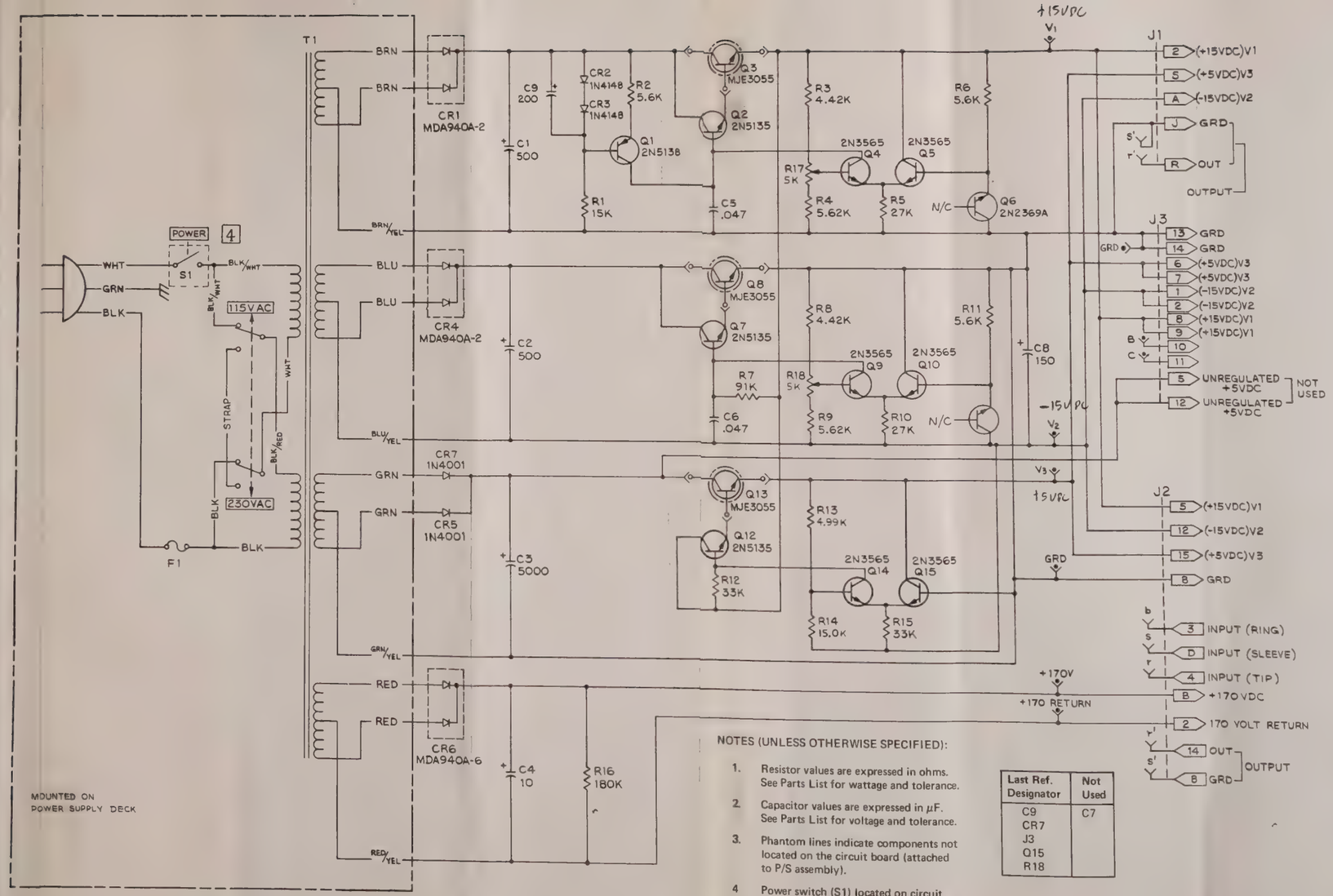
1200/1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
Q6		960100025	27014	2N2369A	TRANSISTOR, 2N2369A	2	
Q7		962000006	07263	2N5135	TRANSISTOR, 2N5135		
Q8					NOT USED		
Q9		962000002	07263	2N3565	TRANSISTOR, 2N3565		
Q10		962000002	07263	2N3565	TRANSISTOR, 2N3565		
Q11		960100025	27014	2N2369A	TRANSISTOR, 2N2369A		
Q12		962000006	07263	2N5135	TRANSISTOR, 2N5135		
Q13					NOT USED		
Q14		962000002	07263	2N3565	TRANSISTOR, 2N3565		
Q15		962000002	07263	2N3565	TRANSISTOR, 2N3565		
	1	P1200-040-01	TTI	P1200-040-01	PRINTED CIRCUIT BOARD NO. 3, REV B	1	
	2	971700002	71279	1457-2-01	TERMINAL, TURRET	6	
	3	971100001	13103	7717-7	SOCKET (TO 18-11)	9	
	4	971100002	JERMYN	TO 5-003	PAD, TO 5-003	3	
	5	971400001	71785	14 D.I.P.	I.C. SOCKET (14 PIN)	1	
	6	970400010	71785	50-30-B-10	CONNECTOR 30 PIN	2	



Component Locating Diagram
TTI 1200B/1202B Power Supply Circuit Board

1200B/1202B POWER SUPPLY CIRCUIT BOARD SCHEMATIC



NOTES (UNLESS OTHERWISE SPECIFIED):

1. Resistor values are expressed in ohms. See Parts List for wattage and tolerance.
2. Capacitor values are expressed in μF. See Parts List for voltage and tolerance.
3. Phantom lines indicate components not located on the circuit board (attached to P/S assembly).
4. Power switch (S1) located on circuit board No. 1.

Last Ref. Designator	Not Used
C9	C7
CR7	
J3	
Q15	
R18	

Table 5-11. 1202B Carrier Frequency Circuit Board.

ASSEMBLY NAME: CARRIER FREQ CIR BOARD
ASSEMBLY NUMBER: P1200-030-02
SHEET: 1 ISSUE: A
ECO: 338

1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1		912200002	STETTNER–TRUSH	10S-TRIKO-24	CAPACITOR, TRIMMER, 5.5-18PF	3	
C2		912200002	STETTNER–TRUSH	10S-TRIKO-24	CAPACITOR, TRIMMER, 5.5-18PF		
C3		912200002	STETTNER–TRUSH	10S-TRIKO-24	CAPACITOR, TRIMMER, 5.5-18PF		
C4		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V	13	
C5		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C6		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C7		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C8		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C9		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C10		910200049	56289	196D476X 9020LA3	CAPACITOR, TANTALEX, 47 μF, 20V	4	
C11		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C12		910200049	56289	196D476X 9020LA3	CAPACITOR, TANTALEX, 47 μF, 20V		
C13		910500017	IMB	NA2B333J	CAPACITOR, MYLAR, .033 μF, 100V	1	
C14		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C15		910400003	72136	DM15-100J	CAPACITOR, SILVER MICA, 10 PF, 500V, 10%	3	OPT.
C16		910400003	72136	DM15-100J	CAPACITOR, SILVER MICA, 10 PF, 500V, 10%		OPT.
C17		910400003	72136	DM15-100J	CAPACITOR, SILVER MICA, 10 PF, 500V, 10%		OPT.
C18		910500037	IMB	ZA2104J	CAPACITOR, MYLAR, .1 μF, 50V	1	
C19		910200049	56289	196D476X 9020LA3	CAPACITOR, TANTALEX, 47 μF, 20V		
C20		910500038	IMB	ZA2A502J	CAPACITOR, MYLAR, .005 μF, 50V	2	
C21		910400026	72136	DM15-220J	CAPACITOR, SILVER MICA, 22 PF, 500V, 10%	3	OPT.

Table 5-11. 1202B Carrier Frequency Circuit Board. (Cont.)

ASSEMBLY NAME: CARRIER FREQ CIR BOARD
ASSEMBLY NUMBER: P1200-030-02
SHEET: 2 ISSUE:
ECO:

1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C22		910400026	72136	DM15-220J	CAPACITOR, SILVER MICA, 22 PF, 500V, 10%		OPT.
C23		910400026	72136	DM15-220J	CAPACITOR, SILVER MICA, 22 PF, 500V, 10%		OPT.
C24		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C25		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C26		910500038	IMB	ZA2A502J	CAPACITOR, MYLAR, .005 μF, 50V		
C27		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C28		910100005	71590	UK10-104	CAPACITOR, DISK, .1 μF, 10V	3	
C29		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C30		910100032	71590	UK20-104	CAPACITOR, DISK, .1 μF, 20V		
C31		910200049	56289	196D476X 9020LA3	CAPACITOR, TANTALEX, 47 μF, 20V		
C32		910100005	71590	UK10-104	CAPACITOR, DISK, .1 μF, 10V		
C33		910100005	71590	UK10-104	CAPACITOR, DISK, .1 μF, 10V		
IC1		950200010	01295	SN7490N	INT CKT, SN7490N	2	
IC2		950200010	01295	SN7490N	INT CKT, SN7490N		
IC3		952000018	07263	FU5E7796393	INT CKT, FU5E 7796393	1	
IC4		950200006	01295	SN7410N	INT. CKT, SN7410N	3	
IC5		950200002	01295	SN7400N	INT. CKT, SN7400N	4	
IC6		952000011	27014	741CN	INT. CKT, 741CN	1	
IC7		950200002	01295	SN7400N	INT. CKT, SN7400N		
IC8		950200002	01295	SN7400N	INT. CKT, SN7400N		

Table 5-11. 1202B Carrier Frequency Circuit Board. (Cont.)

ASSEMBLY NAME: CARRIER FREQ CIR BOARD
ASSEMBLY NUMBER: P1200-030-02
SHEET: 3 ISSUE:
ECO:

TTI 1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC9		950200002	01295	SN7400N	INT. CKT, SN7400N		
IC10		950200006	01295	SN7410N	INT. CKT, SN7410N		
IC11		950200006	01295	SN7410N	INT. CKT, SN7410N		
Q1		960100009	07263	2N4258	TRANSISTOR, 2N4258	2	
Q2		960100009	07263	2N4258	TRANSISTOR, 2N4258		
Q3		962000002	07263	2N3565	TRANSISTOR, 2N3565	1	
R1		930700750	01121	JANRCR07	RESISTOR, CARBON, 75 OHMS, 1/4W, ±5%	3	
R2		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%	6	
R3		930501001	91637	MFF-1/8	RESISTOR, METAL FILM, 1.00K, 1/8W, ±1%	2	
R4		930700101	01121	JANRCR07	RESISTOR, CARBON, 100 OHMS, 1/4W, ±5%	2	
R5		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%	9	
R6		930508061	91637	MFF-1/8	RESISTOR, METAL FILM, 8.06K, 1/8W, ±1%	3	
R7		930501001	91637	MFF-1/8	RESISTOR, METAL FILM, 1.00K, 1/8W, ±1%		
R8		930700750	01121	JANRCR07	RESISTOR, CARBON, 75 OHMS, 1/4W, ±5%		
R9		930506040	91637	MFF-1/8	RESISTOR, METAL FILM, 604 OHMS, 1/8W, ±1%	2	
R10		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R11		930700750	01121	JANRCR07	RESISTOR, CARBON, 75 OHMS, 1/4W, ±5%		
R12		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%		
R13		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%		

Table 5-11. 1202B Carrier Frequency Circuit Board. (Cont.)

ASSEMBLY NAME: CARRIER FREQ CIR BOARD
ASSEMBLY NUMBER: P1200-030-02
SHEET: 4 ISSUE:
ECO:

1202B PARTS LIST

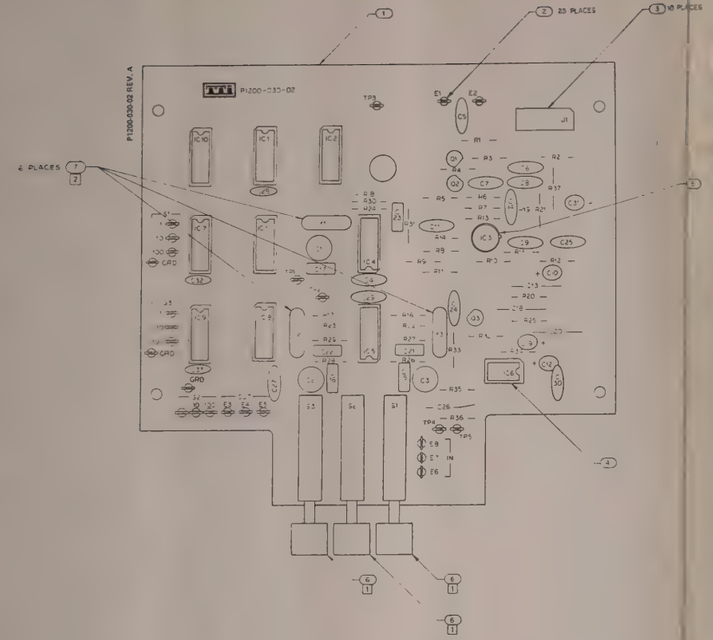
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R14		930501372	91637	MFF-1/8	RESISTOR, METAL FILM, 13.7K, 1/8W, ±1%	1	
R15		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R16		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%		
R17		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%		
R18		930501911	91637	MFF-1/8	RESISTOR, METAL FILM, 1.91K, 1/8W, ±1%		
R19		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R20		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R21		930508061	91637	MFF-1/8	RESISTOR, METAL FILM, 8.06K, 1/8W, ±1%		
R22		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%	6	
R23		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%		
R24		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%		
R25		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R26		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%		
R27		930504020	91637	MFF-1/8	RESISTOR, METAL FILM, 402 OHMS, 1/8W, ±1%	3	
R28		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%		
R29		930504020	91637	MFF-1/8	RESISTOR, METAL FILM, 402 OHMS, 1/8W, ±1%		
R30		930502210	91637	MFF-1/8	RESISTOR, METAL FILM, 221 OHMS, 1/8W, ±1%		
R31		930504020	91637	MFF-1/8	RESISTOR, METAL FILM, 402 OHMS, 1/8W, ±1%		
R32		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R33		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		
R34		930504021	91637	MFF-1/8	RESISTOR, METAL FILM, 4.02K, 1/8W, ±1%		

Table 5-11. 1202B Carrier Frequency Circuit Board. (Cont.)

ASSEMBLY NAME: CARRIER FREQ CIR BOARD
ASSEMBLY NUMBER: P1200-030-02
SHEET: 5 ISSUE:
ECO:

1202B PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R35		930508061	91637	MFF-1/8	RESISTOR, METAL FILM, 8.06K, 1/8W, ±1%		
R36		930506040	91637	MFF-1/8	RESISTOR, METAL FILM, 604 OHMS, 1/8W, ±1%		
R37		930700101	01121	JANRCR07	RESISTOR, CARBON, 100 OHMS, 1/4W, ±5%		
S1		971600035	31918	3XF15STDFSB/ BLK4UGR	SWITCH, 3 STATION, 4 PDT	1	
S2			31918	3XF15STDFSB/ BLK4UGR	PART OF S1		
S3			31918	3XF15STDFSB/ BLK4UGR	PART OF S1		
Y1			CROVEN	A061DDA	CRYSTAL	1	6
Y2			CROVEN	A061DDA	CRYSTAL	1	6
Y3			CROVEN	A061DDA	CRYSTAL	1	6
	1	P1200-031-02	TTI	P1200-031-02	PRINTED CKT BOARD, REV B	1	
	2	971200005	00779	86147-2	TERMINAL, STAKE	25	
	3	971400001	71785	14 D.I.P.	SOCKET, 14 PIN DUAL-IN-LINE	10	
	4	971400007	00779	583640-1	SOCKET, 8 PIN DUAL-IN-LINE	1	
	5	971400008	71785	10-ICS	SOCKET, 10 PIN TO-5	1	
	6		31918	FSB/BLK	BUTTON, SWITCH	3	5
	7	971400016	91506	LSG-4DG1-1	LEAD SOCKET	6	



Component Locating Diagram
TTI 1202B Carrier Circuit Board

NOTES:

1. Switch button shall be selected and installed to agree with crystal frequencies specified on order.
2. Crystal shall be selected to agree with button frequency as specified in crystal frequency table on schematic D-S1200-007-02.

S1200-007-02 REV. A

Ref Des	
Last Used	Not Used
C33	
E8	
IC11	
J1	
Q3	
R37	
S3	
TP5	
Y3	
ES3	

NOTES:

1. Resistor values are expressed in ohms, see Parts List for tolerance and wattage.
2. Capacitor values are expressed in microfrads, see Parts List for tolerance and voltage.
3. See Crystal Frequency Table.
4. When using crystals above 10 MHz, remove C15, or C16, or C17, and make C21, C22, C23, optional.

Ref Des	Crystal Frequency [3]		
	Button Frequency = 1.000 MHz – 10.000 MHz DIVIDE BY 1	Button Frequency = 100 kHz – 1.000 MHz DIVIDE BY 10	Button Frequency = 10 kHz – 100 kHz DIVIDE BY 100
Y1	$[(B.F.)_1 + 1.000\ kHz]$	$10X[(B.F.)_1 + 1.000\ kHz]$	$100X[(B.F.)_1 + 1.000\ kHz]$
Y2	$[(B.F.)_2 + 1.000\ kHz]$	$10X[(B.F.)_2 + 1.000\ kHz]$	$100X[(B.F.)_2 + 1.000\ kHz]$
Y3	$[(B.F.)_3 + 1.000\ kHz]$	$10X[(B.F.)_3 + 1.000\ kHz]$	$100X[(B.F.)_3 + 1.000\ kHz]$

I.C. Ref Des	Device Type	Pin Conn Vcc	Pin Conn Grd	Bypass Cap Ref Des
1	SN7490			C28
2	SN7490			C28
3	FUSE77 96393	–	–	C29
4	SN7410	14	7	C29
5	SN7400	14	7	C29
6	741CN	–	–	C30
7	SN7400	14	7	C32
8	SN7400	14	7	
9	SN7400	14	7	C33
10	SN7410	14	7	
11	SN7410	14	7	

1202B CARRIER CIRCUIT BOARD SCHEMATIC

TTI

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Table 5-12. 1201A Input Circuit Board.

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 1 ISSUE: L
ECO: 341,376

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1		910200011	56289	500D506G016CB7	CAPACITOR, ELECTROLYTIC, 50 μF, 16V	2	
C2		910200011	56289	500D506G016CB7	CAPACITOR, ELECTROLYTIC, 50 μF, 16V		
C3		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V	9	
C4		910500037	27556	ZA2104J	CAPACITOR, MYLAR, 0.1 μF, 50V	1	
C5		910500022	27556	ZA2706J	CAPACITOR, MYLAR, .22 μF, 100V	1	
C6		910700004	27556	BV2A103J	CAPACITOR, POLYCARBON, .01 μF, 5%, 50V	1	
C7		910500008	27556	ZA2447J	CAPACITOR, MYLAR, .68 μF, 100V, 5%	3	
C8		910500036	27556	XA28155J	CAPACITOR, MYLAR, 1.5 μF, 100V, 5%	1	
C9					NOT USED		
C10		910200064	56289	196D474X0050HA1	CAPACITOR, ELECTROLYTIC, .47 μF, 50V	4	
C11		910200064	56289	196D474X0050HA1	CAPACITOR, ELECTROLYTIC, .47 μF, 50V		
C12		910200044	56289	196D105X9035HA1	CAPACITOR, ELECTROLYTIC, 1 μF, 35V	1	
C13		910500005	27556	ZA2444J	CAPACITOR, MYLAR, .33 μF, 100V, 5%	1	
C14		910500008	27556	ZA2447J	CAPACITOR, MYLAR, .68 μF, 100V, 5%		
C15		910500008	27556	ZA2447J	CAPACITOR, MYLAR, .68 μF, 100V, 5%		
C16		910100022	71590	UK25-103	CAPACITOR, CERAMIC DISK, .01 μF, 25V	1	
C17		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V	9	
C18		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C19		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C20		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C21		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 2 ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C22		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C23		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C24		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
C25		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C26		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C27		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C28		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C29		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C30					NOT USED		
C31		910200064	56289	196D474X0050HA1	CAPACITOR, ELECTROLYTIC, .47 μF, 50V		
C32		910400010	72136	DM15-102J	CAPACITOR, MICA, 1000PF, 100V	1	
C33		910200064	56289	196D474X0050HA1	CAPACITOR, ELECTROLYTIC, .47 μF, 50V		
C34		910100019	71590	DD471	CAPACITOR, CERAMIC DISK, 470PF, 1KV	1	
C35		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C36		910200047	56289	196D225X9025HA1	CAPACITOR, ELECTROLYTIC, 2.2 μF, 25V	2	
C37		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C38		910200047	56289	196D225X9025HA1	CAPACITOR, ELECTROLYTIC, 2.2 μF, 25V		
C39		910100005	71590	UK10-104	CAPACITOR, CERAMIC DISK, 0.1 μF, 10V		
C40		910100004	71590	UK25-503	CAPACITOR, CERAMIC DISK, .05 μF, 25V		
CR1					NOT USED		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 3 ISSUE:
ECO:

TTi 1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
CR2					NOT USED		
CR3		940200032	03508	IN4148	DIODE, SILICON IN4148	9	
CR4		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR5		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR6		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR7		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR8		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR9					NOT USED		
CR10		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR11		940200032	03508	IN4148	DIODE, SILICON IN4148		
CR12					NOT USED		
CR13		940200032	03508	IN4148	DIODE, SILICON IN4148		
IC1		952000011	07263	741TC	IC 741TC	7	
IC2		952000011	07263	741TC	IC 741TC		
IC3		954000004	01295	SN74L10N	IC SN74L10N	1	
IC4		952000011	07263	741TC	IC 741TC		
IC5		952000011	07263	741TC	IC 741TC		
IC6		952000011	07263	741TC	IC 741TC		
IC7		952000017	01295	SN72748P	IC SN72748P	4	
IC8		952000017	01295	SN72748P	IC SN72748P		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 4 ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC9		952000011	07263	741TC	IC 741TC		
IC10		952000011	07263	741TC	IC 741TC		
IC11		952000017	01295	SN72748P	IC SN72748P		
IC12		952000017	01295	SN72748P	IC SN72748P		
IC13		950200012	01295	SN7408N	IC SN7408N	1	
IC14		950200006	01295	SN7410N	IC SN7410N	1	
IC15		950200002	01295	SN7400N	IC SN7400N	3	
IC16		950200044	01295	SN74132N	IC SN74132N	1	
IC17		950200023	01295	SN7403	IC SN7403	1	
IC18		950200002	01295	SN7400N	IC SN7400N		
IC19		950200002	01295	SN7400N	IC SN7400N		
IC20		950200014	27014	SN74107N	IC SN74107N	1	
IC21		950200004	01295	SN7404N	IC SN7404N	1	
IC22		950200005	01295	SN7405N	IC SN7405N	1	
IC23		950200019	01295	SN74121N	IC SN74121N	2	
IC24		950200019	01295	SN74121N	IC SN74121N		
K1		971300001	31951	101-001-06	RELAY, REED 6V FORM C	1	
Q1					NOT USED		
Q2		962000005	07263	2N5134	TRANSISTOR, 2N5134	9	

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 5 ISSUE:
ECO:

TTI 1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
Q3					NOT USED		
Q4		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q5		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q6		960100012	07263	2N5139	TRANSISTOR, 2N5139	3	
Q7		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q8		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q9		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q10		962000002	07263	2N3565	TRANSISTOR, 2N3565	2	
Q11		962000002	07263	2N3565	TRANSISTOR, 2N3565		
Q12		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q13		960100012	07263	2N5139	TRANSISTOR, 2N5139		
Q14		960100012	07263	2N5139	TRANSISTOR, 2N5139		
Q15		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q16		962000005	07263	2N5134	TRANSISTOR, 2N5134		
Q17		963000005	32293	2N4391	TRANSISTOR (FIELD EFFECT) 2N4391	1	
R1		930501213	91637	MFF-1/8	RESISTOR, METAL FILM, 121K, 1%, 1/8W	1	
R2		930507502	91637	MFF-1/8	RESISTOR, METAL FILM, 75K, 1%, 1/8W	2	
R3		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K, 1%, 1/8W	5	
R4		930700104	01121	JANRCR07	RESISTOR, FIXED CARBON, 100K, 5%, 1/4W	2	
R5		930503322	91637	MFF-1/8	RESISTOR, METAL FILM, 33.2K, 1%, 1/8W	1	

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 6 ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R6		930501003	91637	MFF-1/8	RESISTOR, METAL FILM, 100K, 1%, 1/8W	3	
R7		930700105	01121	JANRCR07	RESISTOR, FIXED CARBON, 1 MEG OHM, 5%, 1/4W	1	
R8		930501003	91637	MFF-1/8	RESISTOR, METAL FILM, 100K, 1%, 1/8W		
R9		930501330	91637	MFF-1/8	RESISTOR, METAL FILM, 133 OHMS, 1%, 1/8W	1	
R10		930505360	91637	MFF-1/8	RESISTOR, METAL FILM, 536 OHMS, 1%, 1/8W	1	
R11		930700103	01121	JANRCR07	RESISTOR, FIXED CARBON, 10K, 5%, 1/4W	7	
R12		930502323	91637	MFF-1/8	RESISTOR, METAL FILM, 232K, 1%, 1/8W	4	
R13		930502323	91637	MFF-1/8	RESISTOR, METAL FILM, 232K, 1%, 1/8W		
R14		930502323	91637	MFF-1/8	RESISTOR, METAL FILM, 232K, 1%, 1/8W		
R15		930507502	91637	MFF-1/8	RESISTOR, METAL FILM, 75K, 1%, 1/8W		
R16		930700103	01121	JANRCR07	RESISTOR, COMPOSITION, 10K, 5%, 1/4W		
R17		930503400	91637	MFF-1/8	RESISTOR, METAL FILM, 340 OHMS, 1%, 1/8W	1	
R18		930700104	01121	JANRCR07	RESISTOR, FIXED CARBON, 100K, 5%, 1/4W		
R19		930507501	91637	MFF-1/8	RESISTOR, METAL FILM, 7.5K, 1%, 1/8W	3	
R20		930700472	01121	JANRCR07	RESISTOR, FIXED CARBON, 4.7K, 5%, 1/4W	2	
R21		930502323	91637	MFF-1/8	RESISTOR, METAL FILM, 232K, 1%, 1/8W		
R22		930502002	91637	MFF-1/8	RESISTOR, METAL FILM, 20.0K, 1%, 1/8W	2	
R23		930502002	91637	MFF-1/8	RESISTOR, METAL FILM, 20.0K, 1%, 1/8W		
R24		930507501	91637	MFF-1/8	RESISTOR, METAL FILM, 7.5K, 1%, 1/8W		
R25		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K	5	
R26		930507501	91637	MFF-1/8	RESISTOR, METAL FILM, 7.5K, 1%, 1/8W		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 7 ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R27		930501003	91637	MFF-1/8	RESISTOR, METAL FILM, 100K, 1%, 1/8W		
R28		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K		
R29		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K		
R30		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K, 1%, 1/8W		
R31		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K, 1%, 1/8W		
R32		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K, 1%, 1/8W		
R33		930501002	91637	MFF-1/8	RESISTOR, METAL FILM, 10K, 1%, 1/8W		
R34		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K		
R35		930700333	01121	JANRCR07	RESISTOR, FIXED CARBON, 33K, 5%, 1/4W	2	
R36		930700103	01121	JANRCR07	RESISTOR, FIXED CARBON, 10K, 5%, 1/4W		
R37		930700103	01121	JANRCR07	RESISTOR, FIXED CARBON, 10K, 5%, 1/4W		
R38		930700102	01121	JANRCR07	RESISTOR, FIXED CARBON, 1K, 5%, 1/4W	5	
R39		930700103	01121	JANRCR07	RESISTOR, FIXED CARBON, 10K, 5%, 1/4W		
R40		930509090	91637	MFF-1/8	RESISTOR, METAL FILM, 909 OHMS, 1%, 1/8W	1	
R41		930700471	01121	JANRCR07	RESISTOR, FIXED CARBON, 470 OHMS, 5%, 1/4W	1	
R42		930700335	01121	JANRCR07	RESISTOR, FIXED CARBON, 3.3 MEG OHMS, 5%, 1/4W	1	
R43		930700102	01121	JANRCR07	RESISTOR, FIXED CARBON, 1K, 5%, 1/4W		
R44					NOT USED		
R45					NOT USED		
R46		920200502	02111	43P502	RESISTOR, VARIABLE, MULTI-TURN 5K		
R47		930700102	01121	JANRCR07	RESISTOR, FIXED CARBON, 1K, 5%, 1/4W		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 8 ISSUE:
ECO:

1201A PARTS LIST

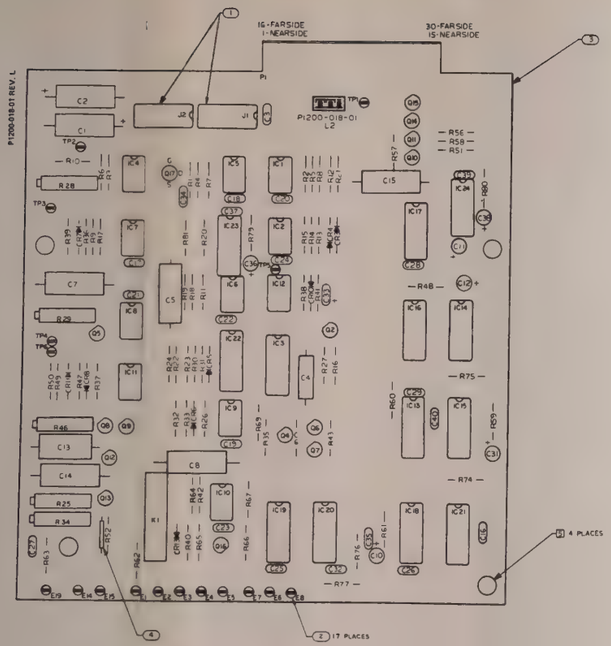
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R48		930700821	01121	JANRCR07	RESISTOR, FIXED CARBON, 820 OHMS, 5%, 1/4W	1	
R49		930700681	01121	JANRCR07	RESISTOR, FIXED CARBON, 680 OHMS, 5%, 1/4W	1	
R50		930700222	01121	JANRCR07	RESISTOR, FIXED CARBON, 2.2K, 5%, 1/4W	1	
R51		930700122	01121	JANRCR07	RESISTOR, FIXED CARBON, 1.2K, 5%, 1/4W	1	
R52		930508250	91637	MFF-1/8	RESISTOR, METAL FILM, 825 OHMS, 1%, 1/8W	1	
R53					NOT USED		
R54					NOT USED		
R55					NOT USED		
R56		930501623	91637	MFF-1/8	RESISTOR, METAL FILM, 162K, 1%, 1/8W	1	
R57		930700333	01121	JANRCR07	RESISTOR, FIXED CARBON, 33K, 5%, 1/4W		
R58		930700101	01121	JANRCR07	RESISTOR, FIXED CARBON, 100 OHMS, 5%, 1/4W	5	
R59		930700101	01121	JANRCR07	RESISTOR, FIXED CARBON, 100 OHMS, 5%, 1/4W		
R60		930700271	01121	JANRCR07	RESISTOR, FIXED CARBON, 270 OHMS, 5%, 1/4W	1	
R61		930700101	01121	JANRCR07	RESISTOR, FIXED CARBON, 100 OHMS, 5%, 1/4W		
R62		930503570	91637	MFF-1/8	RESISTOR, METAL FILM, 357 OHMS, 1%, 1/8W	2	
R63		930503570	91637	MFF-1/8	RESISTOR, METAL FILM, 357 OHMS, 1%, 1/8W		
R64		930504423	91637	MFF-1/8	RESISTOR, METAL FILM, 442K, 1%, 1/8W	1	
R65		930506192	91637	MFF-1/8	RESISTOR, METAL FILM, 61.9K, 1%, 1/8W	1	
R66		930700472	01121	JANRCR07	RESISTOR, FIXED CARBON, 4.7K, 5%, 1/4W		
R67		930700103	01121	JANRCR07	RESISTOR, FIXED CARBON, 10K, 5%, 1/4W		
R68					NOT USED		

Table 5-12. 1201A Input Circuit Board. (Cont.)

ASSEMBLY NAME: INPUT CIRCUIT BOARD
ASSEMBLY NUMBER: P1200-018-01
SHEET: 9 ISSUE:
ECO:

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
R69		930700223	01121	JANRCR07	RESISTOR, FIXED CARBON, 22K, 5%, 1/4W	1	
R70					NOT USED		
R71					NOT USED		
R72					NOT USED		
R73					NOT USED		
R74		930700101	01121	JANRCR07	RESISTOR, FIXED CARBON, 100 OHMS, 5%, 1/4W		
R75		930700102	01121	JANRCR07	RESISTOR, FIXED CARBON, 1K, 5%, 1/4W		
R76		930700102	01121	JANRCR07	RESISTOR, FIXED CARBON, 1K, 5%, 1/4W		
R77		930700101	01121	JANRCR07	RESISTOR, FIXED CARBON, 100 OHMS, 5%, 1/4W		
R78					NOT USED		
R79		930700183	01121	JANRCR07	RESISTOR, FIXED CARBON, 18K, 5%, 1/4W	2	
R80		930700183	01121	JANRCR07	RESISTOR, FIXED CARBON, 18K, 5%, 1/4W		
R81		930700103	01121	JANRCR07	RESISTOR, COMPOSITION, 10K, 5%, 1/4W		
	1	971400001	71785	14 D.I.P.	SOCKET, IC 14 PIN D.I.P.	2	
	2	971200005	00779	86147-2	TERMINAL, STAKING, SMALL	17	
	3	P1200-019-01	– – –	TTI	BOARD, PRINTED CIRCUIT, NO. 2, REV K	1	
	4	No. 22 AWG	– – –	– – –	JUMPER WIRE	AR	

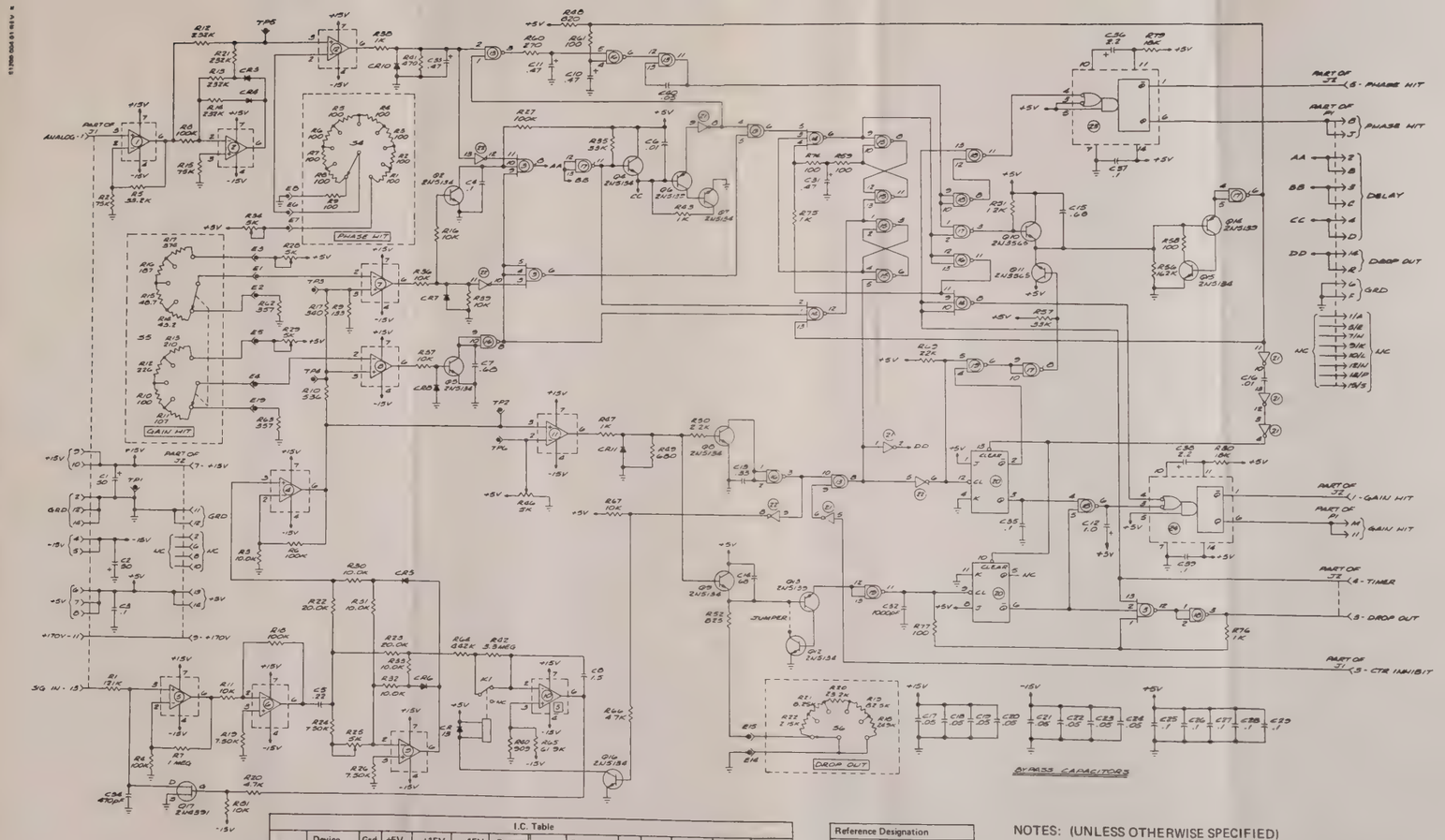


Component Locating Diagram
TTI 1201A Input Circuit Board

NOTES:

1. Reference Schematic D-S1200-004-01.
2. Assemble and solder per TTI Standard Practices and Procedures Manual.
3. Board to be tested per TTI Spec. No. A-B0001-012-01.
4. Conformal coat both sides using 2 coats of 642, type 3, clear acrylic lacquer per WECO Spec. WL-2243 or equivalent. Terminals and component adj screws shall not be coated.

[5] Denotes mounting hole.


PHASE HIT
GAIN HIT
DROP OUT
BYPASS CAPACITORS
PART OF J2 (6 - PHASE HIT)
PART OF J1 (PHASE HIT)
PART OF J2 (1 - GAIN HIT)
PART OF P1 (GAIN HIT)
PART OF J2 (4 - TIMER)
PART OF J2 (5 - DROP OUT)
PART OF J1 (5 - CTR INHIBIT)

I.C. Table

IC No.	Device Type	Grd Pin	+5V Pin	+15V Pin	−15V Pin	Bypass Cap.	IC No.	Device Type	Grd Pin	+5V Pin	+15V Pin	−15V Pin	Bypass Cap.
IC1	SN72741P	–	–	7	4	C20	IC13	SN7408N	7	14	–	–	C29
IC2	SN72741P	–	–	7	4	C24	IC14	SN7410N	7	14	–	–	–
IC3	SN74L10N	7	14	–	–	–	IC15	SN7400N	7	14	–	–	–
IC4	SN72741P	–	–	7	4	–	IC16	SN74132	7	14	–	–	–
IC5	SN72741P	–	–	7	4	C18	IC17	SN7403	7	14	–	–	C28
IC6	SN72741P	–	–	7	4	C22	IC18	SN7400N	7	14	–	–	C26
IC7	SN72748P	–	–	7	4	C17	IC19	SN7400N	7	14	–	–	C25
IC8	SN72748P	–	–	7	4	C21	IC20	SN74107N	7	14	–	–	–
IC9	SN72741P	–	–	7	4	C19	IC21	SN7404N	7	14	–	–	–
IC10	SN72741P	–	–	7	4	C23	IC22	SN7405N	7	14	–	–	–
IC11	SN72748P	–	–	7	4	–	IC23	SN74121N	7	14	–	–	–
IC12	SN72748P	–	–	7	4	–	IC24	SN74121N	7	14	–	–	–

Reference Designation	
Last Used	Not Used
C40	C9,30
CR15	CR1,2,9,12
E19	E9-13,E16,E17,E18
IC24	
K1	
J2	
P1	
Q17	Q1,3
R81	R44,45,53,68, 70,71,72,73,78
TP6	R54, R55

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. All resistor values are in ohms. See Parts List for wattages and tolerances.
2. All capacitor values are in microfarads. See Parts List for voltages and tolerances.
3. All diodes are type IN4148.

1201A INPUT CIRCUIT BOARD SCHEMATIC

Table 5-13. 1201A Counter and Display Circuit Board.

ASSEMBLY NAME: COUNTER & DISPLAY CIR BD
ASSEMBLY NUMBER: P1200-016-01
SHEET: 1 ISSUE: G
ECO: 341

1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
C1					NOT USED		
C2					NOT USED		
C3					NOT USED		
C4		910200011	56289	500D506G016CB7	CAPACITOR, ELECTROLYTIC, 50 μF, 16V	1	
C5		910500007	27556	ZA2446J	CAPACITOR, MYLAR, .47 μF, 100V	1	
C6		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V	6	
C7		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V		
C8		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V		
C9		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V		
C10		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V		
C11		910100005	71590	UK10-104	CAPACITOR, DISCAP, 0.1 μF, 10V		
C12		910200045	56289	196D106X9020JA1	CAPACITOR, TANTALUM, 10 μF, 20V	1	
CR1		940200032	03508	IN4148	DIODE, IN4148	1	
IC1		950200015	01295	SN74141	I.C. DECODER/DRIVER SN74141	3	
IC2		950200015	01295	SN74141	I.C. DECODER/DRIVER SN74141		
IC3		950200015	01295	SN74141	I.C. DECODER/DRIVER SN74141		
IC4		950200025	01295	SN74153	I.C. DUAL MULTIPLEX SN74153	6	
IC5		950200025	01295	SN74153	I.C. DUAL MULTIPLEX SN74153		
IC6		950200025	01295	SN74153	I.C. DUAL MULTIPLEX SN74153		

Table 5-13. 1201A Counter and Display Circuit Board. (Cont.)

ASSEMBLY NAME: COUNTER & DISPLAY CIR BD
ASSEMBLY NUMBER: P1200-016-01
SHEET: 2 ISSUE:
ECO:

TTi 1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
IC7		950200025	01295	SN74153	I.C. DUAL MULTIPLEX SN74153		
IC8		950200025	01295	SN74153	I.C. DUAL MUTLIPLEX SN74153		
IC9		950200025	01295	SN74153	I.C. DUAL MULTIPLEX SN74153		
IC10		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N	13	
IC11		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC12		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC13		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC14		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC15		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC16		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC17		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC18		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC19		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC20		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC21		950200010	01295	SN7490N	I.C. DECADE COUNTER SN7490N		
IC22		950200021	01295	SN7492N	I.C., DIVIDE-BY-TWELVE COUNTER SN7492N	1	
IC23		950200010	01295	SN7490N	I.C., DECADE COUNTER SN7490N		
IC24		950200004	01295	SN7404N	I.C., HEX INVERTER SN7404N	1	
IC25		950200006	01295	SN7410N	I.C., TRIPLE 3-INPUT NAND SN7410N	1	
NX1		971800001	83594	B5870S	NIXIE TUBE, NUMERICAL	3	

Table 5-13. 1201A Counter and Display Circuit Board. (Cont.)

ASSEMBLY NAME: COUNTER & DISPLAY CIR BD
ASSEMBLY NUMBER: P1200-016-01
SHEET: 3 ISSUE:
ECO:

1201A PARTS LIST

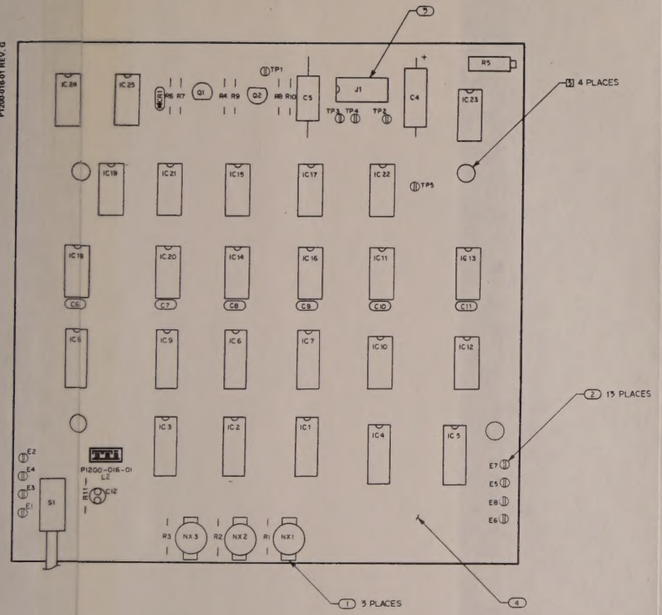
REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
NX2		971800001	83594	B5870S	NIXIE TUBE, NUMERICAL		
NX3		971800001	83594	B5870S	NIXIE TUBE, NUMERICAL		
Q1		960100010	04713	MPSL01	TRANSISTOR, GENERAL PURPOSE	1	
Q2		962000017	04713	MU4894	TRANSISTOR, GENERAL PURPOSE	1	
R1		930700103	01121	JANRCR07	RESISTOR, FIXED CAR., 10K, 5%, 1/4W	4	
R2		930700103	01121	JANRCR07	RESISTOR, FIXED CAR., 10K, 5%, 1/4W		
R3		930700103	01121	JANRCR07	RESISTOR, FIXED CAR., 10K, 5%, 1/4W		
R4		930700221	01121	JANRCR07	RESISTOR, FIXED CAR., 220 OHMS, 5%, 1/4W	1	
R5		920200504	02111	43P504	RESISTOR, VARIABLE, MULTI-TURN 500K	1	
R6		930700152	01121	JANRCR07	RESISTOR, FIXED CAR., 1.5K, 5%, 1/4W	1	
R7		930700103	01121	JANRCR07	RESISTOR, FIXED CAR., 10K, 5%, 1/4W		
R8		930506493	91637	MFF-1/8	RESISTOR, METAL FILM, 649K, 1%, 1/8W	1	
R9		930700101	01121	JANRCR07	RESISTOR, FIXED CAR., 100 OHMS, 5%, 1/4W	1	
R10		930504123	91637	MFF-1/8	RESISTOR, METAL FILM, 412K, 1%, 1/8W	1	
R11		930700223	01121	JANRCR07	RESISTOR, FIXED CAR., 22K, 5%, 1/4W	1	
S1		971600020	31918	IXFFSB/ BLK2U0A	SWITCH, PUSHBUTTON DPDT MOMENTARY	1	

Table 5-13. 1201A Counter and Display Circuit Board. (Cont.)

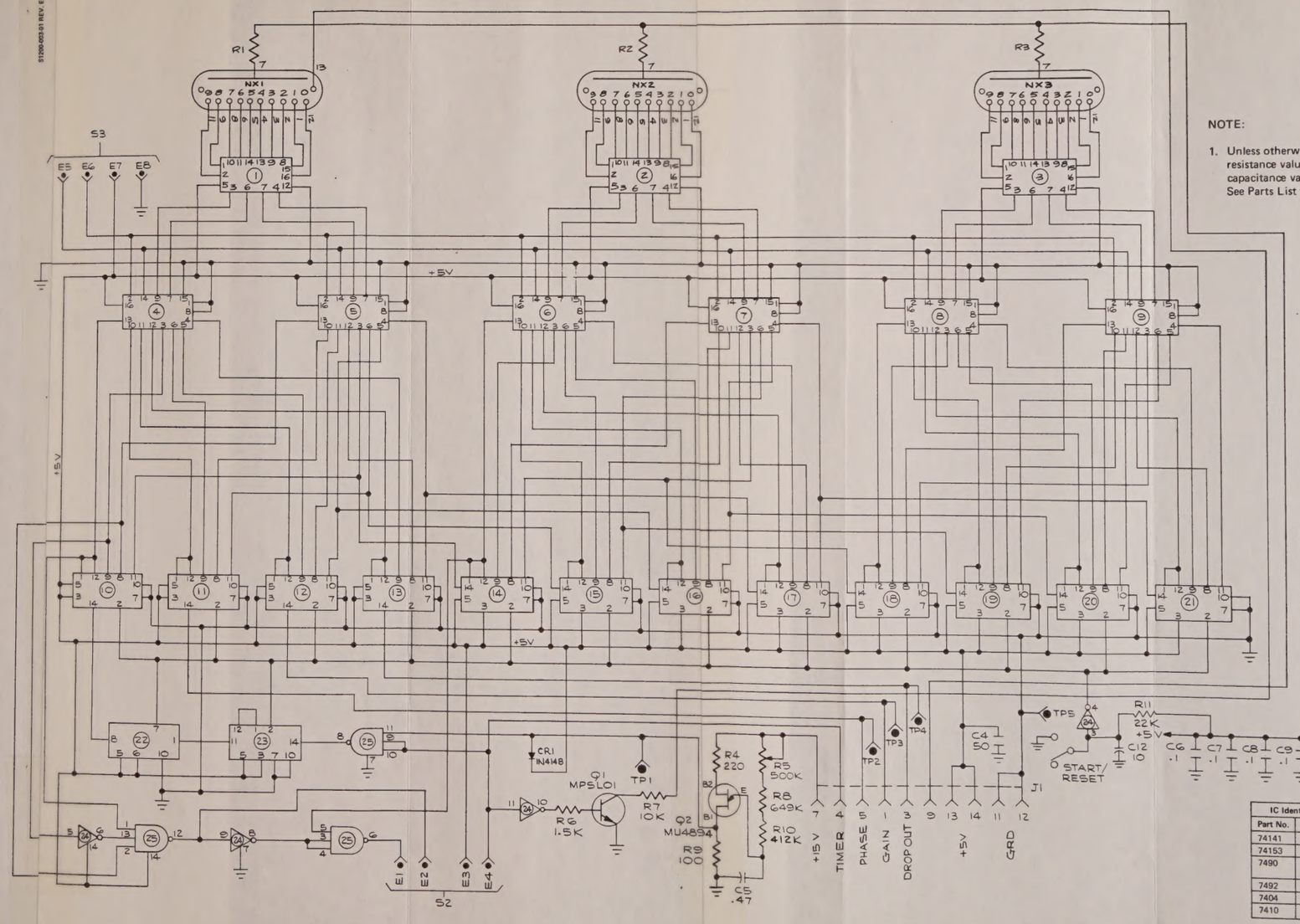
ASSEMBLY NAME: COUNTER & DISPLAY CIR BD
ASSEMBLY NUMBER: P1200-016-01
SHEET: 4 ISSUE:
ECO:

TTI 1201A PARTS LIST

REF DES	ITEM NO.	TTI STOCK NO.	MFR CODE IDENT	MANUFACTURERS PART NUMBER	DESCRIPTION	TOTAL QTY	NOTES
	1	971400004	83594	SK-138	SOCKET, NIXIE TUBE	3	
	2	971200005	00779	86147-2	TERMINAL, STAKING-SMALL	13	
	3	971400001	71785	14 D.I.P.	I.C., SOCKET, 14 PIN DUAL-IN-LINE	1	
	4	P1200-017-01	TTI	P1200-017-01	PRINTED CIRCUIT BOARD NO. 1, REV F	1	



Component Locating Diagram
TTI 1201A Counter and Display Circuit Board



NOTE:

1. Unless otherwise specified, resistance values are in ohms, capacitance values are in μF. See Parts List for tolerance.

Last Ref. Designator	
IC25	CR1
R11	
Q2	
C12	
NX3	
E9	
S1	
J1	
TP5	
NOT USED	
C1, C2, C3	

IC Identification	
Part No.	Ref. Desig.
74141	IC1, IC2, IC3
74153	IC4 thru IC9
7490	IC10 thru IC21 & IC23
7492	IC22
7404	IC24
7410	IC25

1201A COUNTER and DISPLAY CIRCUIT BOARD SCHEMATIC